SELECTED

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RESOURCES

ABSTRACTS

U.S. DEPARTMENT OF THE INTERIOR · MARCH 3, 1849

Selected Water Resources Abstracts includes abstracts of current monographs, journal articles, translations, and reports. The contents of these documents cover the physical, life, and social science, as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water.

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SELECTED
WATER RESOURCES ABSTRACTS

VOLUME 1. NUMBER 7

JULY 1968

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R202870X68A IMPACT OF WORLD FOOD NEEDS ON U S CROPS

At present growth rates of world population and food supply, the United States may of necessity return all reserve acres to production by 1975. We will face the problem of producing each year about 30 to 40% more grain and soybeans than can be used in this country. World food production has lagged behind population growth since 1958. Increase in food production is rising in a straight-line relationship, while world population is rising more rapidly as an exponential curve. Population growth is greatest in Latin America, Africa, and Asia in the "warm band" around the earth where grain crops are less adapted. Food production in these countries cannot be expected to grow at the rate population is growing. Priority must be placed on reducing population growth rather than increasing production to meet food needs. Since 1961, world grain needs have been met by reducing grain reserves at the rate of about 10 million tons a year. The United States farm problems in the last third of this century will be (1) how to produce much more than our domestic needs without large build-up of carryover and (2) how to develop farm policies to prevent the farmer from assuming the burden of an unexpectedly large carryover.

R202870X68A

Thompson, Louis M

IMPACT OF WORLD FOOD NEEDS ON AMERICAN AGRICULTURE

Iowa State University, Ames

DESCRIPTORS--/ *foods/ *agriculture/ *crops/ cereals/ population growth/ population/ foreign countries/ planning/ land resources/ policy matters/ land utilization/ consumption/ production control/ economics/ soil management

IDENTIFIERS-- / *worldwide/ grains (crops)/ wheat/ farms

R202892X68A SOIL CORROSIVITY ON CAST IRON PIPE

Standards are given for evaluating the corrosive tendencies of soils toward centrifugally cast gray or ductile iron pipes. These standards were based upon correlation of experiences with gray cast iron pipe and known soil characteristics. Field and laboratory tests for soils and interpretation of results are discussed. Tests included: (1) 3 electrical resistivity methods, (2) pH determination, (3) oxidation reduction potential, (4) moisture content, and (5) description of soil type. Recommended methods for protecting cast iron pipes from corrosion are protective coatings and cathodic means. Studies indicated the most satisfactory protective system for cast iron pipe, under all observed soil conditions, utilized 8-mil loose polyethylene tubing.

R202892X68A

Smith, W Harry

SOIL EVALUATION IN RELATION TO CAST-IRON PIPE

Cast Iron Pipe Research Association, Chicago, Ill

DESCRIPTORS--/ corrosion/ *corrosion control/ cast iron/ soil tests/ electrical resistivity/ soil moisture/ pH/ soil classification/ plastic tubing/ standards/ reduction/ oxidation/ water pipes/ polyethylenes/ cathodic protection/ protective coatings/ water supply systems/ soils/ iron/ pipes/ *pipelines
IDENTIFIERS-- / cast iron pipe/ *underground corrosion/ soil resistivity/ gray cast iron/ ductile cast iron/ *soil corrosiveness

R202860X68A SELECTION OF LARGE DIAMETER WATER PIPE
One of the most important decisions required in designing large water
pipe distribution systems is the selection of the most appropriate pipe
material. The basic factors in selecting the material are: (1) suit-
ability for required service, (2) service life, and (3) economy of in-
stallation and maintenance. Types of pipe discussed and compared are
reinforced concrete steel cylinder pipe, ductile-iron pipe, and fabri-
cated electrically welded steel pipe. The 3 basic materials covered in
this discussion can be made equivalent in service life by using proper
alternative specifications. The only way to determine the base cost of
a project is to take alternative bids on pipe furnished and installed.
The initial cost will be controlled by the following principal factors:
(1) internal pressures, trench loads, and embedment requirements. (2)
pipe deflection related to shell thickness, (3) field joints, length
of pipe sections, and blocking, and (4) corrosion protective coatings.
The best pipe material would be selected then on the basis of minimum
annual amortized construction cost over the life span of the pipeline
plus annual maintenance cost.

R202860X68A

Proudfit, D P

SELECTION OF MATERIALS FOR LARGE DIAMETER WATER PIPE

Amer Soc Civil Engs Preprint 606, Nat Meeting Transp Eng, San Diego,
Calif, Feb 1968. 14 p, 11 ref

Black and Veatch Consulting Engineers, Kansas City, Mo

DESCRIPTORS--/ *pipes/ *pipelines/ *materials/ *concrete pipes/ *steel
pipes/ iron/ deflection/ joints/ anchors/ corrosion control/ coal tar
coatings/ coatings/ flexible tubing/ rigid tubing/ bedding materials/
maintenance/ installation/ cost comparisons/ water supply systems

IDENTIFIERS-/ *ductile cast iron/ Spangler formula/ embedment depth/
buried pipes

R202868X67A TRANSFORMATION OF SLOPES BY SLIDES
Recession of an abrasion bench occurring during transformation of a
reservoir shore can be regarded as the result of the joint action of
the following processes: (1) direct erosion of rocks in the lower part
of the bench and erosion of the abrasion shoal, (2) disintegration of
rocks on the exposed surface of the bench during weathering, (3) caving
of rock blocks from the upper part of the bench caused by erosion of
the lower part of the bench, and (4) destruction of the bench by slides.
When slopes are reworked by slides the rate of destruction of shores
depends largely upon the development of weathering and slide movements.
A method of predicting the transformation of slopes is discussed. The
effect of each of the above processes is considered in this method.
Practical use is possible only after thorough study of engineering
geological conditions of the slope for which the forecast of transfor-
mation is made and after determination of general patterns of formed
slopes of an identical geological structure.

R202868X67A

Tikhvinskii, I O

PREDICTING THE TRANSFORMATION OF SLOPES AFFECTED BY SLIDES

Hydrotech Constr, No 4, pp 353-357, Apr 1967. 5 p, 2 fig, 10 ref

DESCRIPTORS-- / *slopes/ *landslides/ *erosion/ rocks/ abrasion/ *wave
action/ geology/ waves/ reservoirs/ civil engineering/ shore protection/
*shores/ drawdown/ shoaling/ engineering geology

IDENTIFIERS-- / foreign research/ USSR/ *wave energy

R202896 68A COMPUTATION OF STRAIN IN CONCRETE

The computational procedure used to reduce data from embedded strain meters to strain in surrounding concrete is described in detail. An illustrative example shows the steps in computing strain from data provided by an arbitrarily chosen strain meter of a standard group in a Bureau of Reclamation dam. Descriptions of a Carlson strain meter and a test set used to read such meters are included. Records of the preinstallation tests of the meter used in the example are included to illustrate the uses of these data in the computations. Arithmetical computations shown in the example were made using a desk calculator. Automatic data processing (ADP) methods use essentially the same procedures. An appendix is included describing a more accurate method of distributing experimental errors that is practical only for use in ADP methods.

R202896 68A

Jones, Keith

THE COMPUTATION OF STRAIN IN CONCRETE USING STRAIN METER DATA

Bur Reclam Dams Br Rep No DD-5, Apr 1968. 48 p, 14 fig, 1 photo, 3 tab, 4 ref, append

Bureau of Reclamation, Denver, Colo

DESCRIPTORS--/ *concrete dams/ instrumentation/ stress analysis/ measuring instruments/ calculations/ computation/ concrete/ computers/ *structural behavior/ temperature/ Poisson ratio/ elastic theory/ *strain/ elastic deformation/ *strain measurement/ errors

IDENTIFIERS-- / *strain meters/ autogenous shrinkage/ Carlson strain meter/ embedded instruments/ least squares method

R202875 68A ELASTICITY AND CREEP OF CONCRETE

Longtime creep studies were performed on 12 sealed portland cement concrete mixes. Results indicate that sustained compressive modulus of elasticity and creep of concrete, after any particular period of constant load, can be predicted easily from the initial modulus value at load application and fixed R-line relationships. An R-line represents graphically the relationship between initial secant modulus and sustained secant modulus of loaded concrete. The effects of many variables on R-lines are reported and discussed. Some of these are: intensity and time of load; aggregate types, sizes, and amounts; cement amounts; pozzolans and admixtures; age of concrete; moisture conditions; removal of stress; uneven stress; and temperature. Moduli relations for some epoxy resin mortars and concretes and some rock materials under sustained compressive loads are discussed. Has 21 references.

R202875 68A

Hickey, Ken B

CREEP OF CONCRETE PREDICTED FROM ELASTIC MODULUS TESTS

Bur Reclam Lab Rep C-1242, Concrete Struct Br, Jan 1968. 29 p, 11 fig, 1 photo, 7 tab, 21 ref

Bureau of Reclamation, Denver, Colo

DESCRIPTORS-/ *creep/ *concrete/ *elasticity modulus/ deformation/ concrete technology/ strain/ bibliographies/ recovery/ epoxies/ concrete testing/ forecasting/ laboratory tests/ mechanical properties/ rocks/ correlation techniques

IDENTIFIERS--/ epoxy resins/ epoxy mortar/ sustained loads/ longtime tests/ concrete properties/ rock properties/ *creep tests

R202878X68A RHEOLOGY OF FRESH CONCRETE
The problem of measuring concrete workability is approached by studying
stability, compactibility, and mobility of fresh concrete. Stability is
characterized by bleeding and segregation tendencies. Compactibility is
directly related to relative density. Mobility is shown to be a func-
tion of cement paste viscosity, cohesion of mix, and angle of internal
resistance to deformation. Workability tests and test results are dis-
cussed. The main conclusions are: (1) classification of degrees of
workability should not be based on the compacting factor test; (2) sta-
bility, compactibility, and mobility are all necessary to determine the
suitability of any mix; (3) if a range of mixes is suitably stable, the
final selection should be based upon relative compactibility and mobil-
ity requirements; (4) compactibility is completely recorded by the ex-
tended compacting factor test; (5) mobility can be characterized by the
angle of internal resistance from the triaxial test, or by the Vebe
test. Has 54 references.

<div align="right">R202878X68A</div>

Ritchie, Alistair, G B

THE RHEOLOGY OF FRESH CONCRETE

Proc Amer Soc Civil Engs, J Constr Div, Vol 94, No CO1, pp 55-74, Jan
1968. 20 p, 10 fig, 3 tab, 54 ref

University of Strathclyde, Glasgow, Scotland

DESCRIPTORS-/ *workability/ *rheology/ concrete/ bibliographies/
compaction/ concrete control/ *concrete mixes/ concrete placing/ flow/
*concrete testing/ bleeding (concrete)/ viscosity/ *concrete technology/
density

IDENTIFIERS--/ stability/ foreign testing/ Great Britain/ *concrete
properties

R202880X68A CORROSION CONTROL FOR CONCRETE
Improved practices and techniques of formulating concrete have increased
corrosion resistance and reduced deterioration. However, in many envi-
ronments concrete may be susceptible to chemical attack. Fundamental
facts on composition of concrete and physical characteristics are dis-
cussed, and documented information on corrosion of reinforcing metal is
presented. Methods of protecting concrete and reinforcing metal are
given. Many thermoplastic and thermosetting materials for use as pro-
tective coatings are discussed. Ceramics and some inorganic chemicals
are considered for surface treatment. The information presented is in-
tended as an introduction and should not be used as a guide on protec-
tion of concrete structures.

<div align="right">R202880X68A</div>

Castleberry, Jerry R

CORROSION PREVENTION FOR CONCRETE AND METAL REINFORCING IN THE
CONSTRUCTION INDUSTRY

Mater Protect, Vol 7, No 3, pp 21-28, Mar 1968. 8 p, 1 photo, 12 ref

DESCRIPTORS--/ corrosion/ *corrosion control/ *concrete/ deterioration/
concrete technology/ *reinforced concrete/ reinforcing steel/ chlorides/
physical properties/ chemical stability/ frost action/ metals/ paints/
concrete structures/ prestressed concrete/ *protective coatings/ air
entrainment/ organic compounds
IDENTIFIERS--/ corrosion resistance/ concrete linings/ concrete
properties/ thermosetting plastics

R202861X68A TRANSPORTING HEAVY EQUIPMENT
Unusual problems encountered and solutions considered for transporting
the extremely heavy equipment for the Grand Coulee Third Powerplant are
discussed. The powerplant, ultimately to be the world's largest, is a
major feature of the Bureau of Reclamation's Columbia Basin Project.
Also discussed is permanent handling equipment to lift and convey the
2000-ton rotors for the 600,000-kw generators, the 500-ton turbine run-
ners, and other unusually large and heavy equipment components within
the powerplant. Railways can, by special routing and in special multi-
axle cars, carry loads up to 300 tons, provided clearance requirements
can be met. Oversize components will be transported on special trucks
or by a combination of barges and special land equipment. An investiga-
tion was conducted by the Bureau to determine the adequacy of the bridge
spanning the existing spillway to carry loads up to 350 tons. Con-
tractors will be responsible for transporting all equipment and materi-
els to the construction site without damage to existing facilities.

R202861X68A

Arthur, H G

TRANSPORTING EQUIPMENT FOR GRAND COULEE THIRD POWERPLANT

Amer Soc Civil Engs Preprint 651, Nat Meeting Transp Eng, San Diego,
Calif, Feb 1968. 25 p, 10 fig

Bureau of Reclamation, Dever, Colo

DESCRIPTORS--/ *transportation/ barges/ bridges/ highway bridges/ draft
tubes/ railroads/ *scheduling/ powerplants/ turbines/ critical path
method/ turbine parts/ generators/ gates/ programs/ penstocks/ *hoisting
machinery/ construction/ *hydroelectric powerplants/ hydraulic turbines

IDENTIFIERS--/ equipment installation/ *Grand Coulee Pwrplt, Wash/
*construction equipment/ Washington/ construction methods/ cranes

R202864X68A CONSTRUCTION CONTROL BY PHOTOGRAMMETRY
Numerical photogrammetry is being used for construction survey control
of a 24-mi portion of Interstate 8 in San Diego County. The project is
characterized by rugged, brush-covered, rocky terrain. Numerical photo-
grammetry can be used to establish a density of horizontal and vertical
points throughout the construction corridor of a highway project. Nu-
merical expressions of photogrammetric measurements are given as X, Y, Z
coordinates in a rectangular space coordinate system. Once a stereo-
model is set in an instrument and oriented to precisely fit both hori-
zontal and vertical photocontrol, the instrument operator has complete
freedom to make machine coordinate measurements at any point in the mod-
el space. Each measurement is independent of other measurements but ac-
curacy of all measurements is dependent on ground control. In the first
test standard error in a majority of the points in the horizontal and
vertical directions was 0.24 ft and 0.28 ft, respectively. These results
indicate the procedure to be satisfactory. Basic steps of the method
are outlined.

R202864X68A

Katibah, George P

CONSTRUCTION CONTROL BY PHOTOGRAMMETRIC METHODS

Amer Soc Civil Engs Nat Meeting Transp Eng, San Diego, Calif, Feb 19-23,
1968. 19 p, 6 fig

California Division of Highways, Sacramento

DESCRIPTORS./ *photogrammetry/ photographic equipment/ triangulation
nets/ photography/ *surveying/ highways/ measurement/ control/ cameras/
measuring instruments/ numerical method/ stereoscopic photography/
construction/ *aerial photography/ *control systems/

IDENTIFIERS--/ *construction control/ construction methods/ construction
practices/ highway engineering/ coordinates

R202867X67A ROCK WORK AT CHIRKEI, USSR
The Chirkei Hydroelectric Powerplant is being built on the Sulak River
in the Caucasian foothills. The main structures (236-m-high concrete
arch dam, powerplant, spillway, and diversion tunnel) are situated in a
250-m-deep gorge in a platy limestone. The rock masses on both flanks
are jointed and potentially unstable. During the preparatory period of
the project, unstable rock masses were removed and slopes trimmed by a
smooth-wall contour blasting method.   The blasting and excavation pro-
cedures are described. These methods were applied to rock excavation
for the dam foundation and abutments to preserve the base under dam
abutments, to ensure stability of high slopes in the foundation excava-
tion, and to protect the flanks against the formation of deep cracks
and disturbances from blasting.

R202867X67A

Erakhtin, B M

ROCK WORK IN THE CONSTRUCTION OF THE CHIRKEI HYDROELECTRIC POWER
STATION

Hydrotech Constr, No 4, pp 305-313, Apr 1967. 9 p, 10 fig, 1 tab

DESCRIPTORS-- / *rock excavation/ drill holes/ boreholes/ blasts/ arch
dams/ explosions/ *abutments/ *dam foundations/ slopes/ construction/
foreign construction/ foreign projects/ limestones/ excavation/
concrete dams

IDENTIFIERS-- / *smooth wall blasting/ blasting/ rock slope stability/
Chirkei Hydro Proj, USSR/ USSR/ rockfalls/ rock joints/ rock breakage

R202888X66A CONSTRUCTION OF THE KARA-KUM CANAL
The Kara-Kum Canal is located in Turkmenia, the most arid territory in
the Soviet Union. Climate of Turkmenia is favorable, but low rainfall
and high evaporation make agricultural cultivation impossible without
irrigation. In 1966 the canal was more than 800 km long and the irri-
gated area was about 165,000 hectares. Water intake in the canal was
200 cu m/sec in 1965. Problems in planning and constructing the canal
included: (1) selecting the alinement, (2) choosing the construction
method for the intake, (3) determining magnitude of losses by percola-
tion and evaporation, (4) protecting against wind erosion in the sandy
desert, and (5) selecting a construction method to use in quicksand.
These problems and their solutions are discussed. Large water losses
are tolerated because only 20-21% of available water is being utilized.
The canal is used for transportation, carrying vessels with tonnage up
to 500 tons. Experimental work shows that vegetation can be controlled
by either deepening the canal to a minimum of 5.5 m or adding herbiv-
orous fish.

R202888X66A

Gueldiev, A G

CONSTRUCTION OF THE KARA-KUM CANAL IN TURKMENISTAN

Trans Int Comm Irrig Drainage, Vol 1, pp C133-C142, 1966. 14 p, 5 fig

Kara-Kum Canal Construction, USSR

DESCRIPTORS--/ *canals/ canal seepage/ canal embankments/ construction/
*irrigation canals/ irrigation/ foreign construction/ seepage losses/
unlined canals/ navigation/ deserts/ dredging/ aquatic weeds/ fish/
weed control/ evaporation/ sedimentation/ intake structures

IDENTIFIERS-- / Karakum Canal, USSR/ USSR

R202883 68A ESTIMATING SPILLWAY DESIGN FLOOD

Procedures for fixing the spillway design flood for intermediate or
large dams can be divided into 2 categories; deterministic and prob-
abilistic. No unanimously accepted methodology is available at present
for estimation of floodflows from either large or small catchment areas.
Magnitude of design flood obtained by the deterministic method is fre-
quently so large, that if it were incorporated in spillway design, the
required structure would be uneconomic. The greatest challenge to the
hydrologist using the probabilistic method is to determine the proper
distribution function for flood variables. Regardless of the method
used to predict design flood, the probability of failure exists, though
slight. Application of economics illustrates the impossibility of
guaranteeing the complete safety of any dam and the impracticality of
making a structure strong enough to withstand all conceivable critical
factors. Hence, risk cannot be completely eliminated but can be re-
duced to some specified acceptable level. Has 27 references.

R202883 68A

Biswas, Asit K

PHILOSOPHY OF ESTIMATING SPILLWAY DESIGN FLOOD

Eng Inst Canada Conf, Halifax, Nova Scotia, May 1968. 19 p, 2 fig,
2 tab, 27 ref

Queen's University, Kingston, Ontario, Canada

DESCRIPTORS--/ *dam failures/ *safety/ safety factors/ spillways/ codes/
*spillway design flood/ probability/ methodology/ hydraulic structures/
foreign design practices/ economics/ hydrology/ flood forecasting/
flood/ damages/ bibliographies/ design flood/ maximum probable flood/
design storm
IDENTIFIERS--/ probable maximum preciptatn

R202890X68A ESTIMATING STREAM DEPLETION BY WELLS

Effect of pumping a well on flow of a nearby stream can be calculated
readily using dimensionless curves and tables. Computations can be made
of: (1) rate of stream depletion at any time during pumping period or
after cessation of pumping; (2) volume induced from the stream during
any time, during pumping or after cessation of pumping; and (3) effects,
in rate and volume of stream depletion, of any selected pattern of in-
termittent pumping. Sample computations illustrate the use of curves
and tables. An example shows that intermittent pumping may have a pat-
tern of stream depletion not greatly different from a pattern for steady
pumping of an equal volume. Residual effects of pumping on streamflow
after cessation of pumping, may be greater than effects during the pump-
ing period. Adequate advance planning including consideration of resid-
ual effects is essential to effective administration of a stream-aquifer
system.

R202890X68A

Jenkins, C T

TECHNIQUES FOR COMPUTING RATE AND VOLUME OF STREAM DEPLETION BY WELLS

Ground Water, Vol 6, No 2, pp 37-46, Mar-Apr 1968. 10 p, 5 fig, 3 tab,
10 ref, append

Geological Survey, Denver, Colo

DESCRIPTORS-- / *streamflow/ *rivers/ *wells/ *ground water/ groundwater
flow/ aquifers/ drawdown/ water management/ *water measurement

IDENTIFIERS-- / *streamflow depletion/ pumping/ *withdrawal/ groundwater
management/ *effect

DRAINAGE AND GROUND WATER

R202891X68A PUMPING TEST ANALYSIS

A resistance network analog was used to study the early stages of a pumping test in an unconfined aquifer. Results were compared with an alternative analysis by Boulton in 1965, and good agreement was obtained. Unlike the theoretical analysis, the analog technique is versatile and can be used to study pumping tests with nonidealized boundary conditions, e.g., partially penetrating wells can be simulated. The analog method of analysis could prove to be more realistic for studying pumping tests than standard analytical techniques. Observation well readings were poor indicators of water table elevation during the early stages of the test; a pumping test based on discharge measurements is a more suitable method for pumping test analysis.

R202891X68A

Herbert, Robin

ANALYSING PUMPING TESTS BY RESISTANCE NETWORK ANALOGUE

Ground Water, Vol 6, No 2, pp 12-18, Mar-Apr 1968. 7 p, 10 fig, 1 photo, 1 tab, 8 ref

Birmingham University, England

DESCRIPTORS--/ analysis/ *electric analogs/ networks/ aquifers/ water table/ *wells/ *ground water/ *analogs/ drawdown/ simulation/ *electrical resistivity/ observation wells

IDENTIFIERS-- / Great Britain/ *pumping tests/ water level/ water wells

ELECTRICAL ENGINEERING

R202866X68A NUCLEAR POWER IS SUDDENLY HERE

Development of nuclear power during the past 10 years is reviewed and predictions made for the future growth of nuclear plants in the United States. Electric utilities have decided that use of uranium fuel is economically competitive with fossil fuel in many heavily populated and highly industrialized areas of the U S. Concern over air pollution has been an important factor in the swing to nuclear fuel for power generation. Trends to nuclear power elsewhere in the world are reviewed. At least 25 nations will have commercial nuclear power plants by the mid-1970's. Types of reactors, their advantages and economies are discussed. Nuclear power, not only for generation of electric power, but as a source of heat for desalination plants and industrial processing plants throughout the world is examined.

R202866X68A

Shaw, Milton and Whitman, Merrill

NUCLEAR POWER: SUDDENLY HERE

Sci Technol, No 75, pp 22-34, Mar 1968. 13 p, 16 fig, 6 photo

Cincinnati Milling Machine Co, Ohio

DESCRIPTORS--/ *nuclear powerplants/ electric power/ public utilities/ economics/ atmospheric pollution/ *electric power production/ foreign countries/ thermal powerplants/ thermal power/ *nuclear energy/ costs/ safety/ quality control/ accidents/ industrial plants

IDENTIFIERS--/ *nuclear power/ *nuclear reactors/ nuclear safety/ *nuclear technology/ nuclear fuels/ fossil fuels/ uranium/ plutonium

R202893X68A POWER SYSTEM DEVELOPMENTS, 1968 TO 2030

Planning for research and development of power system equipment, has
been on a short-term basis and has not taken into account overall plan-
ning for the industry. The author makes long-range predictions, to the
yr 2030, to clarify the research and development picture and place needs
and times in proper perspective. From a vantage point in 1968, a ra-
tional prediction can be made for electric power systems development
well beyond 2000 by basing the prediction on time required for develop-
ment, manufacture, installation, and useful life of equipment in ser-
vice. Equipment for power systems planned for the late 1960's will not
be in service for 5 to 10 yr, will have a useful life of 30 to 50 yr,
and will still be in service in 2005 to 2025. Ehv 1000-kv equipment
under development will be operating in power systems up to 2035, and
equipment in the research stage may still be in service in 2045. Real-
istic planning for power system expansion, using techniques beyond the
concept of ehv grids, will: (1) guide new equipment development; (2)
serve to place on a rational basis selection of rights of way and gen-
erating plant sites; and (3) formulate schedules for placing underground
all present overhead facilities. Has 21 references.

R202893X68A

Kusko, Alexander

A PREDICTION OF POWER SYSTEM DEVELOPMENT, 1968 TO 2030

Alexander Kusko, Inc, Cambridge, Mass

DESCRIPTORS-/ transmission (electrical)/ electric power/ bibliographies/
*forecasting/ electric powerplants/ electrical equipment/ electric power
industries/ extra high voltage/ superconductivity/ magnetohydrodynamics/
*planning/ technology/ *electric power production/ sociology/ research
and development/ design/ *electric power demand
IDENTIFIERS--/ superconductors/ electric conductors/ *underground cables/
*electrical design/ service life

R202897X68A CARRIER LOSSES ON ICE-COVERED POWERLINES

Propagation of high-frequency signals along a powerline is adversely
affected by deposits of ice or hoarfrost on conductors. A difficulty
arises in applying conventional modal analysis to a study of effects of
ice on propagation, since the lossy ice layer forms a discontinuity at
its surface with the lossless air. An analytical method to eliminate
this difficulty was proposed, based on the transformation of nodal-
charging current networks derived for ice-covered systems of parallel
conductors. The method allows conventional lossy line analysis to be
applied to propagation problems on ice-covered multiconductor power-
lines. An example is given of calculating powerline carrier attenuation
attributable to ice contribution on a 2-pole d-c line with bundled con-
ductors. Electrical properties of ice at high frequencies are discussed
and general equations for lossy line analysis are given.

R202897X68A

Perz, Matthias C

ANALYTICAL DETERMINATION OF HIGH-FREQUENCY PROPAGATION ON ICE-COVERED
POWER LINES

University of British Columbia, Vancouver, Canada

DESCRIPTORS--/ *powerline carriers/ *ice/ *transmission lines/ analysis/
losses/ *attenuation/ bundled conductors/ direct currents/ capacitance/
*high frequency/ contamination/ electrical engineering/ communications/
calculations/ curves/ field tests

IDENTIFIERS-- / *electric conductors/ communication systems/ ice forming/
*ice cover

R202898X68A CONTAMINATION TESTING OF 500-KV ARRESTERS
The effects of external surface contaminants and moisture on internal
sparkover of lightning arresters are of prime concern in design of extra
high voltage stations. Contamination alone rarely causes arrester fail-
ure. Characteristically, failures occur shortly after addition of water
or moisture to the surface of a contaminated arrester. If moisture or
contaminant is unevenly distributed, causing redistribution of electri-
cal potential, overvoltage on 1 or more sections of an ehv arrester may
cause external flashover or internal sparkover and subsequent failure of
the entire arrester. Design and acceptance sparkover and contamination
tests performed on several different ratings of a multiunit arrester,
specifically used on 500-kv systems, are described and results tabulat-
ed. Sparkover characteristics were determined for various degrees of
surface contamination and several different methods of surface wetting.

R202898X68A

Gothberg, Arthur W; Koerber, Arthur R; Zanzie, Charles E

CONTAMINATION TESTING OF ARRESTERS FOR 500-KV SYSTEMS

DESCRIPTORS-- / extra high voltage/ *contamination/ laboratory tests/ rain/
electric currents/ *test procedures/ test facilities/ impulse tests
(electrical)/ electric potential/ transmission (electrical)/ performance
tests/ atmospheric pollution/ electrical equipment/ standards/ *electric
insulation/ alternating currents/ fogs/ lightning
IDENTIFIERS-- / *lightning arresters/ flashover/ leakage current/ switching
surges/ lightning protection/ protection (electrical)/ wetting

R202899X68A POWER SYSTEMS LOAD SHEDDING POLICIES
The problem of optimum dispatching minimizes cost of production and
transmission of electrical power to meet a specified demand under normal
operating conditions. Using and extending the methodology of optimum
dispatching to problems encountered during abnormal operating conditions
are logical and desirable. A systematic approach toward minimizing
curtailment of service in a power system after a severe fault is dis-
cussed. Minimizing load curtailment under a given set of emergency con-
ditions was formulated as a problem of static optimization, subject to
operational and equipment constraints; and a feasible steady-state solu-
tion was obtained for the postfault network. Starting with this solu-
tion, the optimum was approached by a gradient technique. A computa-
tional procedure was based on the Newton-Raphson technique for solving
power flow equations and the Kuhn-Tucker theorem for optimizing. Ana-
lytical results were verified on a 26-node sample problem. Two typical
emergency situations were considered: (1) loss of generation, and (2)
loss of a tieline interconnection. The same optimizing procedure and
computed dual variables can be used for computer programs involving op-
timum service restoration, generation reserve scheduling, and system ex-
pansion studies. Has 16 references.

R202899X68A

Hajdu, Laszlo P; Peschon, John; Tinney, William F; et al

OPTIMUM LOAD-SHEDDING POLICY FOR POWER SYSTEMS

DESCRIPTORS-./ electric power/ *power system operations/ electric power
demand/ transmission (electrical)/ electric power failures/ *electrical
stability/ faults (electrical)/ electric power production/ transmission
lines/ overloads/ algorithm/ computer programming/ bibliographies

IDENTIFIERS-/ *power dispatching/ *load shedding/ interconnected systems/
*optimum loading/ *power system stability/ spinning reserve

R202901X68A RESEARCH FOR BETTER TRANSMISSION DESIGNS
The Frank B Black Research Center is being built by The Ohio Brass Co
near Wadsworth, Ohio, as a new facility for research and development in
the electrical industry. Laboratories will be available for study of
special utility projects and for improvement of transmission and distri-
bution materials. A controlled-atmosphere enclosure for contamination
tests, and facilities for stringing conductors at representative tension
on full-scale towers designed for service up to above 1000-kv ac or dc
will be features of new laboratories to be dedicated later in 1968. Ad-
ditional equipment is being installed for indoor and outdoor tests of
transmission and distribution gear. Operating largely as independent
laboratories will be facilities devoted to basic ceramic research, ad-
vanced product research, chemistry, and physics.

R202901X68A

Winters, Douglas E

BIG RESEARCH CENTER SEEKS BETTER TRANSMISSION DESIGNS

Elec World, Vol 169, No 17, pp 30-32, Apr 1968. 3 p, 1 fig, 6 photo

The Ohio Brass Co, Mansfield

DESCRIPTORS--/ *transmission (electrical)/ transmission lines/ research
and development/ *test facilities/ transmission towers/ direct currents/
alternating currents/ *laboratories/ laboratory equipment/ performance
tests/ *extra high voltage/ electrical equipment/ electric generators

IDENTIFIERS--/ electrical insulation tests/ electric conductors/ electrical
design/ lightning arresters

R202894 68A AN APPRAISAL OF SAND DRAIN PROJECTS
The New York State Department of Transportation investigated 4 major
projects to determine the effectiveness of sand drain design, construc-
tion, and performance. Sand drains were successful in 3 projects pro-
viding foundation stability and eliminating detrimental pavement settle-
ment. The other project had serious postconstruction settlement after
the road was opened. The principal findings of the investigation
were: (1) the classic theory of soil consolidation predicted the be-
havior of sand drain treatment accurately, (2) unsatisfactory per-
formance of 1 project was caused by using displacement methods to
install the sand drains, (3) moisture content changes in samples taken
before and after construction reflected observed settlement accurately,
and (4) gain in shear strength was greater than the predicted increase
used for design analysis. Design and construction considerations are
presented as a guide to individuals and organizations involved with
sand drain projects.

R202894 68A

Moore, Lyndon H and Grosert, Thomas

AN APPRAISAL OF SAND DRAIN PROJECTS

New York State Dep Transp Phys Res Rep 68-1, Feb 1968. 71 p, 37 fig,
1 tab, 12 ref, 3 append

New York State Department of Transportation, Albany

DESCRIPTORS-/ *sand drains/ *foundations/ design/ construction/ auger
borings/ performance tests/ highways/ settlement/ shear tests/ pore
pressures/ *drainage systems/ consolidation/ laboratory tests/ design
criteria/ permeability/ finegrained soils/ piezometers/ shear strength

IDENTIFIERS--/ *drains/ drain spacing/ drain holes/ construction control

R202906 67A SATELLITE DETECTION OF NATURAL RESOURCES
Data secured by remote sensing systems in orbit around the earth may
assist man in meeting his increasing requirements for nonrenewable
natural resources. Satellite-borne devices have the great advantage
of showing very large areas of the earth's surface at a given time and
revealing large structural features such as anticlines and/or major
fault systems not otherwise clearly seen. High orbital speeds enable
repetitious observations of the same areas at different times of day,
night, or year, with the capability of framing them in global text.
Evaluation of natural resources by orbiting instruments may provide
the impetus to expand our reserves. The Geological Survey is working
on a program dedicated to the idea that earthquakes are predictable.
Satellite surveys of the earth's fault patterns would be a part of
this program. That organization is also evaluating satellite sensor
exploration in the fields of geography, cartography, and hydrology.

R202906 67A

Fischer, William A

SATELLITE DETECTION OF NATURAL RESOURCES

Pract Space Appl, Vol 21, pp 399-408, 1967. 10 p, 7 ref

Geological Survey, Flagstaff, Ariz

DESCRIPTORS--/ *natural resources/ *sensors/ *satellites (artificial)/
earthquakes/ faults (geology)/ explorations/ *aerial photography/
mapping/ photogrammetry/ minerals/ petroleum/ folds/ radar/ geology/
infrared rays/ geological surveys/ space engineering

IDENTIFIERS-- / surveys (data collection)/ images/ *remote sensing/
geologic defects/ Geological Survey

R202907 67A STRESSES AT EARTHQUAKE FOCI
Study of earthquakes indicates that, in the majority of cases, the
focus must be a shift by shearing of one side of a subsurface discon-
tinuity relative to the other. The stress state in the focus and the
elastic stress field of the earth are closely related to the phenomena
of earthquakes. Data are presented on: (1) stresses acting on earth-
quake foci for 6 seismically active zones of the earth; (2) orientation
of these stresses; (3) typical features of the stress state; and (4)
the overall elastic stress field of the earth. In each region either
the largest relative compression or largest relative tension was di-
rected parallel to a horizontal plane; and in all regions except one,
that horizontal plane was perpendicular to the strike of tectonic fea-
tures. The single exception was the Mediterranean region where tec-
tonic structure was very complex. World maps show the orientation of
compressive and tensile stresses on earthquake foci. Has 23 refer-
ences.

R202907 67A

Balakina, L M; Vvedenskaya, A V; Misharina, L A; et al

THE STRESS STATE IN EARTHQUAKE FOCI AND THE ELASTIC STRESS FIELD OF THE
EARTH

Phys Solid Earth, No 6, pp 333-342, June 1967. 11 p, 5 fig, 2 tab,
23 ref

DESCRIPTORS--/ *earthquakes/ *seismology/ geophysics/ stress analysis/
stress distribution/ shear/ compression/ tensile stress/ geology/
bibliographies/ faults (geology)/ stress/ seismic waves

IDENTIFIERS-- / earthquake focus/ *tectonics/ earthquake theory/ USSR/
foreign research/ earthquake zones

R202908 67A   RECURRENCE RATE OF EARTHQUAKES

The seismic activity map, compiled from a study of the earthquake recur-
rence rate for a number of areas in a region, is the quantitative indi-
cator of seismicity of that region. Characterizing areas by their seis-
mic activity departs from the usual map presentation of discrete spatial
distribution of epicenters. Points discussed are: (1) size of elements
of area for a seismic activity map of a region possibly reaching 400 sq
km; (2) period of study of seismic data for these maps; and (3) freedom
to consider the seismic field as statistically homogeneous in time and
space. Seismicity in an area can be assessed from year to year and from
place to place. Homogeneity establishes seismic activity values for
satisfactorily forecasting small and medium strength earthquakes, but is
less accurate for large earthquakes. The time between main earthquakes
was the buildup time of stresses in the earth's crust.

R202908 67A

Gaiskii, V N

DETERMINATION OF THE RECURRENCE RATE OF EARTHQUAKES BY MEANS OF A
SEISMIC ACTIVITY MAP

Phys Solid Earth, No 6, pp 343-349, June 1967. 7 p, 13 fig, 23 ref

DESCRIPTORS-/ *earthquakes/ statistical analysis/ correlation techniques/
probability/ seismology/ seismic design/ geophysics/ *forecasting/ maps/
geology/ statistics/ foreign design practices/ bibliographies

IDENTIFIERS--/ earthquake focus/ epicenters/ *earthquake zones/ earthquake
engineering/ USSR

R202859X68A   FLOW OF WATER IN PIPELINES

The physical and chemical characteristics of water combined with the
type and quality of material on the interior of pipe are the most impor-
tant factors in the overall hydraulic analyses of a waterworks transmis-
sion and distribution system. Modern day pipeline materials and linings
can provide conduits which maintain good flow characteristics under nor-
mal conditions for long periods of time. The Hazen-Williams formula is
satisfactory for hydraulic calculations of losses in the flow of water
in pipes with proper attention to the value of the roughness coefficient
within limits of accuracy of all factors involved. Pertinent details
for solution of the Hazen-Williams formula for 6- to 72-in. diameter-
pipe are tabulated. Graphical solutions are given indicating the losses
of various flows and related velocities in sizes 6- to 48-in. diameter
for various roughness coefficients. Friction losses calculated by vari-
ous formulas for 12- and 24-in.-diameter pipe are compared graphically.

R202859X68A

Friend, A M

FLOW OF WATER IN PIPELINES

Amer Soc Civil Engs Preprint 598, Nat Meeting Transp Eng, San Diego,
Calif, Feb 1968. 16 p, 6 fig

Ralph L Woolpert Co, Dayton, Ohio

DESCRIPTORS--/ *flow/ *fluid flow/ *pipelines/ *pipes/ *concrete pipes/
*steel pipes/ *closed conduits/ *closed conduit flow/ energy losses/
roughness coefficients/ flow resistance/ head losses/ velocity/
hydraulic gradients/ hydraulics/ friction/ Manning formula/ fluid
friction/ linings
IDENTIFIERS--/ Hazen-Williams formula/ Darcy-Weisbach formula/ Scobey
formula/ friction coefficient (hyd)/ friction head

R202869X67A SUBMERGED INLETS TO DEEP SLUICES

An investigation of inlets to deep rectangular sluices was conducted at
the V V Kuibyshev Moscow Civil Engineering Institute. Theoretical
shape of vacuum-free inlets is discussed and compared with the optimum
shape of inlets as determined by hydraulic model tests. The inclina-
tion of the upstream face of the structure and the slope of the con-
duit bottom noticeably affect the outlines of a vacuum-free inlet.
Cavitation characteristics are reported. The correct shape of an inlet
to deep sluices should ensure that: (1) cavitation does not occur, (2)
unfavorable transitional regimes do not arise in the sluice on changing
to a pressure flow from free flow or vice versa, and pressure remains
stable, and (3) inlet bellmouth dimensions and shape are small and
simple.

R202869X67A

Rozanov, N P; Konakhovich, N Ya; Orlova, L N

INVESTIGATION OF SUBMERGED INLETS TO DEEP RECTANGULAR SLUICES

DESCRIPTORS--/ *inlets/ *outlet works/ *submerged orifices/ *sluices/
submergence/ vacuum/ cavitation/ hydraulics/ negative pressures/
hydraulic gates and valves/ foreign design practices/ laboratory tests/
hydraulic models/ *shapes/ *rectangular conduits

IDENTIFIERS--/ bellmouths/ USSR/ foreign research

R202871X68A REVIEW OF CAVITATION RESEARCH ON VALVES

This review covers 10 yr of valve research, from 1957 to 1967. A
brief discussion of each research program is presented and includes:
what prompted the study, valve or valves tested, instrumentation used
to detect cavitation, general test procedures and equipment, and per-
tinent findings. Research literature is presented chronologically and
includes material on the following types of valves: needle, gate, globe,
butterfly, fixed-roller gate, radial gate, cone, ball or sphere,
straight flow, and disc. Critical cavitation indices are presented for
12-in. ball and 12-in. butterfly valves installed in a closed circuit
system with a sudden downstream enlargement. Tests were conducted under
normal operating conditions. Additional tests were conducted to deter-
mine the effect of injecting air and water at various locations on the
critical cavitation index. Results demonstrated that on injecting water
into the sudden enlargement below the valves did not affect cavitation.
However, injecting small quantities of air into the separation zones
below the valves did reduce materially the cavitation intensity and
hence the critical cavitation index.

R202871X68A

Tullis, J Paul and Marschner, Bernard W

REVIEW OF CAVITATION RESEARCH ON VALVES

Colorado State University, Fort Collins

DESCRIPTORS--/ *cavitation/ hydraulics/ valves/ butterfly valves/ gate
valves/ globe valves/ *hydraulic gates and valves/ instrumentation/
test procedures/ closed conduits/ pipes/ hydraulic structures/ research
and development/ model tests/ needle valves/ test facilities/ sudden
enlargements/ laboratory tests/ reviews/ high pressure valves
IDENTIFIERS--/ *cavitation index/ cavitation control/ cavitation noise/
*hydraulic design

R202873X68A BOUNDARY-LAYER AT CURVED CONDUIT ENTRANCE

To gain a better understanding of energy reduction in a conduit inlet shaped according to potential-flow theory, boundary-layer measurements were made in a noncirculating air duct with circular, square, and rectangular inlets. Results are compared with those obtained from a numerical solution of boundary-layer equations. The compound elliptical-shaped conduit of the U S Corps of Engineers was adopted in all 3 cases. Effect of conduit Reynolds number on growth of laminar and turbulent boundary layers in the inlet portion of the conduit was studied. Comparison showed that energy reduction is higher for a rectangular inlet and least for a circular one. This is because near zero-pressure-gradient conditions are attained sooner in a rectangular inlet as an effect of the elliptic curve of the broad faces. Graphs are given showing coefficients of energy reduction as functions of relative distance into the inlet and the Reynolds number.

R202873X68A

Rao, Palepu V

BOUNDARY-LAYER DEVELOPMENT AT CURVED CONDUIT ENTRANCES

University of Roorkee, India

DESCRIPTORS--/ *boundary layer/ *boundaries/ conduits/ hydraulics/ pipes/ flow/ hydraulic models/ *hydraulic conduits/ hydraulic engineering/ energy/ *energy losses/ model tests/ *entrances/ numerical method/ laminar flow/ turbulent flow/ *inlets/ Reynolds number/ head losses

IDENTIFIERS--/ turbulent boundary layers

R202889X66A CHANNEL ROUGHNESS IN MOVABLE BED MATERIAL

Results of studies in field and laboratory channels on the roughness of movable and deformable beds are presented. Data for 3 different sands with average diameters 0.308 mm, 0.327 mm and 0.459 mm are given and conclusions presented. Results for channels of trapezoidal sections of 2 different bed widths are shown, along with ripple characteristics for comparison. Studies on sands with a sprinkled layer of cement are also given for evaluation of grain resistance. A compartive study of different procedures for eliminating sidewall effects (Einstein, Horton, and Pavlovski methods) shows that for fixed and rippled beds, values of bed roughness are the same for Einstein's and Horton's methods. Attempts have been made to analytically compute values of Manning's n from vertical velocity distributions. Ven Te Chow's formula yielded results comparable to experimentally obtained values of n.

R202889X66A

Pramanik, H R and Sarkar, S N

A STUDY OF ROUGHNESS OF CHANNELS IN MOVABLE BED MATERIAL

River Research Institute, West Bengal, Calcutta, India

DESCRIPTORS--/ open channels/ *movable bed models/ *roughness/ sands/ *roughness coefficients/ *stable channels/ *trapezoidal channels/ open channel flow/ hydraulic models/ laboratory tests/ field tests/ Manning formula/ velocity distribution/ hydraulics/ canals/ *streambeds

IDENTIFIERS--/ bed movements/ *bed roughness/ bedload movement/ India/ rippled surfaces/ bed ripples/ Pavlovski coefficient/ ripple marks

R202917X66A LATERAL DISPERSION IN POROUS MEDIA

Experiments are carried out to determine the coefficient, D, of lateral dispersion in flow through porous media, with values of R between 0.3 and 380. It is found that, when R reaches a value of about 10, there is a change in the relationship between the coefficient D and the seepage velocity. The data indicate that the variation of the flow pattern with the Reynolds number is important in the study of dispersion, even when Darcy's law is applicable. This study is part of an investigation supported by Grant WP00575 from the Bureau of State Services, Public Health Service of the US Department of Health, Education, and Welfare, now Federal Water Pollution Control Administration, US Department of the Interior.

R202917X66A

Li, Wen-Hsiung and Lai, Fu-Hsiung

EXPERIMENTS ON LATERAL DISPERSION IN POROUS MEDIA

Syracuse University, N Y

DESCRIPTORS--/ permeability/ *dispersion/ *flow/ hydraulics/ Reynolds number/ coefficients/ water filters/ filters (fluid)/ porous media/ filters/ flow characteristics/ flow measurement/ flow rates

IDENTIFIERS--/ flow patterns/ flow distribution

R202924X67A SUBCRITICAL FLOW OVER HIGHWAY EMBANKMENTS

A highway embankment, when overtopped by floodwaters, is a form of broad-crested weir. As a weir, the flood discharge over the embankment is only a function of an upstream depth for free flow conditions. Free flow exists when critical depth occurs on the roadway, usually near the crown line. If a structure or vegetation downstream from the embankment controls the stage-discharge relationship, the depth of flow at the embankment may be raised sufficiently to prevent the occurrence of critical depth on the roadway. If critical depth does not occur, then subcritical (submerged) flow exists over the embankment. A method for determining the discharge under submerged flow conditions using an upstream and a downstream flow depth is presented. The method is illustrated using data collected from model highway embankments.

R202924X67A

Skogerboe, Gaylord V and Hyatt, M Leon

SUBCRITICAL FLOW OVER HIGHWAY EMBANKMENTS

Utah State University, Logan

DESCRIPTORS--/ embankments/ *highways/ hydraulics/ *subcritical flow/ *submerged weirs/ submergence/ discharge measurement/ weirs/ floods/ water measurement/ flow measurement

IDENTIFIERS--/ *submerged flow/ *broad-crested weirs/ free flow

R202872X68A STOCHASTIC ANALYSIS OF DAILY RIVER FLOWS

Optimum water resources design may be achieved using data generation
techniques based on models statistically derived from historical re-
cords of a hydrologic variable. However, certain statistical tech-
niques of time series analysis are restricted to series possessing the
time-invariance property which hydrologic data might not possess. The
analysis of riverflow records in light of this limitation is presented.
To mathematically represent daily streamflow, a trend-free model with
an oscillatory component and an autoregressive process is postulated.
The oscillatory component is detected and isolated using spectral and
Fourier analysis, and Markov schemes are fitted to the standardized
residual series. Adequacy of the models is examined by comparison of
theoretical variance with computed variance. The importance of the
underlying series, the sequence generated in Monte Carlo techniques,
is discussed. Has 19 references.

R202872X68A

Quimpo, Rafael G

STOCHASTIC ANALYSIS OF DAILY RIVER FLOWS

University of Pittsburgh, Pa

DESCRIPTORS/ mathematical analysis/ rivers/ *streamflow/ *streamflow
forecasting/ runoff/ statistical analysis/ streamflow records/ Fourier
analysis/ hydrology/ streams/ hydrographs/ *runoff forecasting/ streams/
simulation/ bibliographies/ water resources/ hydraulics/ series
(mathematics)
IDENTIFIERS--/ *stochastic models/ mathematical models/ Markov model/
stochastic processes

R202874X68A UNIT GRAPHS FOR NONUNIFORM RAINFALL

Correlation between Snyder's basin constants consisting of a lag co-
efficient and a peak magnitude coefficient, and basin physical charac-
teristics of drainage area, total length, average slope length to the
center of area, and elongation is established using synthetic data.
Actual data are used to compensate for discrepancies introduced through
initial use of synthetic data. Effects of nonuniform rainfall distri-
bution on the basin runoff hydrograph are represented by a unit graph,
selected from 3 computed for each basin. Computation formulas are pre-
sented to define each of the 3 basin unit graphs. A dimensionless unit
graph is introduced for a more accurate definition of the rising and
falling links of each unit graph. The system presented was tested with
success and is believed to be generally representative of the hydro-
logic response characteristic of a drainage basin.

R202874X68A

Buil, Jose A

UNIT GRAPHS FOR NONUNIFORM RAINFALL DISTRIBUTION

Corps of Engineers, Kansas City, Mo

DESCRIPTORS--/ *unit hydrographs/ drainage basins/ watersheds/ *runoff/
*rainfall/ hydrographs/ *distribution/ surface runoff/ hydrology/ flood
peaks/ digital computers/ computer programming/ storms/ rainfall
intensity/ runoff coefficients/ flood hydrographs/ hydrologic data/
correlation techniques
IDENTIFIERS--/ *rainfall-runoff relation/ Snyders unit graph/ rainfall
disposition/ storm patterns/ storm duration/ peak discharge

R202886X68A DISSIPATIVE RIVER FLOW MODEL

Derivation and solution of a second order linear differential equation
for the instantaneous unit hydrograph of a stream are presented. Deri-
vation of the equation has 3 basic assumptions: (1) an analogy exists
between current flow in an electrical circuit and hydraulic flow in a
river; (2) the watershed can be divided into a series of n reaches with
the same values of constants for all reaches; and (3) outflow from a
reach is proportional to the difference in potential energy in the
reach. The differential equation is easily solved for n equal 1, but
solution becomes progressively more difficult as n increases. Some
suggestions for simplifying the model are made, but evaluation of
these suggestions must await further study. The writer's model appears
closely related to Dooge's model, having 4 deg of freedom compared to
5 for Dooge's model, but is simpler to use since prior knowledge of
watershed hydraulics is not required.

R202886X68A

Jackson, Donald R

A DISSIPATIVE RIVER FLOW MODEL

J Hydrol, Vol 6, No 1, pp 33-44, Jan 1968. 12 p, 3 fig, 7 ref, 2 append

University of Pittsburgh, Pa

DESCRIPTORS--/ *rivers/ models/ *streamflow/ hydrology/ *flow/ rainfall/
*unit hydrographs/ differential equations/ hydrologic data/ *streamflow
forecasting/ flood routing/ computer programming/ streams/ runoff/
surface runoff/ hydrographs/ reaches (distance)

IDENTIFIERS-- / *instantaneous unit hydrographs/ *dissipation/ *river flow/
LaPlace equations/ mathematical models/ *hydrologic models

R202903 67A APPLICATIONS OF SPACE OBSERVATIONS

This paper is a brief summary of progress in applying data obtained by
instrumented spacecraft to the environmental sciences. Data from satel-
lites provide information that can greatly benefit all mankind. Meteo-
rologists using data from present operational weather satellites can
guarantee that no major storm can form anywhere on earth without being
accurately located on the day of its birth. Satellites now under con-
struction will make possible prediction of storm formation and motion
more accurately and earlier. Sensors presently under construction will
make possible mapping of ocean currents, turbidity, and temperature.
Sensors measuring radiance from land surfaces will greatly simplify col-
lecting earth surface data in sparsely populated areas. This new data
source can be applied to such problems as: (1) locust control in des-
erts, (2) snow field mapping in mountains, and (3) ice and snow mapping
over inland lakes and rivers. Data collection, now a multibillion dol-
lar industry, is helped and challenged by the combination of data-
gathering and data-transmitting earth-synchronous satellites.

R202903 67A

Oliver, Vincent J

SOME APPLICATIONS OF SPACE OBSERVATIONS TO METEOROLOGY, OCEANOGRAPHY
AND HYDROLOGY

Preprint, Fourth Annu Meeting, Amer Inst Aeron Astronautics, Anaheim,
Calif, Oct 1967. 10 p, 11 fig, 10 ref

National Environmental Satellite Center, Washington, DC

DESCRIPTORS--/ *aerial photography/ sensors/ *satellites (artificial)/
space engineering/ oceanography/ hydrology/ meteorology/ *snow surveys/
weather forecasting/ ocean currents/ data collection system/ mapping/
cloud cover/ ice/ storms/ radiation measurement/ environment

IDENTIFIERS-- / fishing/ water resources management/ snow cover/ ice cover/
remote sensing

R202928 67A SIMULATION OF THE RED RIVER
A mathematical model of the Red River of the North Basin, Minnesota and
North Dakota, can be used as a water quality planning management tool
to simulate time and spatial variations of flow and concentrations of
total dissolved solids throughout the basin. Other parameters of water
quality can be included in the model with little effort. The model in-
corporates hydrologic and water quality data and the Fiering-Pisano
mathematical model described in the report "River Basin Simulation Pro-
gram" issued by the Office of Comprehensive Planning and Programs,
March 1967. Given (1) the River Basin Simulation Program, (2) this re-
port, and (3) tape of operational hydrology, other investigators can
study various combinations of water quality management schemes. This
report describes the application of the Fiering-Pisano mathematical
model to the Red River of the North Basin. The report describes per-
tinent hydrologic factors, waste loadings to the river system, and
methods of applying the model to determine effects of water management
practices in the basin. The report presents the model in a form that
is applicable to other river basin systems for which appropriate data
are available.

R202928 67A

Anon

FITTING THE RED RIVER OF THE NORTH BASIN TO THE GENERAL RIVER BASIN
SIMULATION PROGRAM

Federal Water Pollut Contr Admin Div Tech Contr Compr Planning &
Program Rep, Apr 1967. 32 p, 10 fig, 4 tab, 5 ref, append

Federal Water Pollution Control Administration, Washington, D C

DESCRIPTORS--/ streamflow forecasting/ *river basins/ water resources/
water quality/ *simulation/ water management/ hydrologic data/ river
forecasting/ hydrology/ *mathematical models/ *model studies/ dissolved
solids

IDENTIFIERS-- / *Red Riv of the North Basin

R202879 68A INVESTMENT DECISION FOR SEEPAGE REDUCTION
Expenditures undertaken for the purpose of seepage control are standard
examples of the investment problem under which expenditures are made at
some point in time in anticipation of attaining a larger future stream
of income. A general framework for making optimal planning decisions
calls for the following elements; criteria for making choices, a set
of alternative courses of action or policies proposed as solutions to
the problem, and expected outcomes or consequences of each policy.
While less than an ideal criterion, maximizing net national income is
preferable to any purely physical entity as a criterion for choice.
Valuing water savings should be performed by determining added cost of
the least expensive alternative source of water. If no additional
water is available, the value in use must be estimated. Estimating the
value productivity of water is a difficult task but 2 techniques are
suggested.

R202879 68A

Young, Robert A

THE INVESTMENT DECISION FOR SEEPAGE REDUCTION

Second Seepage Symp, Phoenix, Ariz, Mar 1968. 10 p, 6 ref

University of Arizona, Tucson

DESCRIPTORS--/ seepage/ *seepage losses/ cost comparisons/ costs/ water
costs/ *economics/ *optimum use/ social values/ public opinion/ values/
interest (finance)/ decision making/ benefit-cost ratios/ irrigation/
irrigation practices

IDENTIFIERS-- / investment/ *water losses/ *seepage control

R202881 68A ECONOMIC COMPARISON OF IRRIGATION SYSTEMS

Comparisons of open conduit and pipe irrigation distribution systems are discussed on economic basis. To conserve water and secure other benefits, planners must consider fully lined canals or pipes for all constructed waterways for conveyance and distribution of project water supplies. When planning new projects, the Bureau of Reclamation requires full justification for plans not providing for lining canals. In areas where an excess of irrigable land is available for the water supply or where other potential uses exist for water, canal linings or pipes generally will be economically justified. Other advantages of lined canals or pipes such as reduced operation, maintenance, and replacement costs are listed. An economic analysis of unlined versus lined canals and pipe distribution systems is given. Generally the most significant tangible benefit, in addition to the value of water conserved, is reduced OM&R costs. A table of typical OM&R costs and gross crop values for states served by Reclamation projects is given.

R202881 68A

Prichard, B A

ECONOMIC COMPARISONS OF OPEN CONDUIT AND PIPE IRRIGATION DISTRIBUTION SYSTEMS

Pap Second Seepage Symp, Phoenix, Ariz, Mar 1968. 15 p, 2 tab, 4 ref

DESCRIPTORS--/ economics/ canals/ *canal linings/ open channels/ linings/ cost comparisons/ irrigation/ *distribution systems/ benefit-cost ratios/ operation and maintenance/ water pipes/ *pipelines/ planning/ pipes/ capital costs/ *irrigation systems/ irrigation O&M

IDENTIFIERS--/ *economic evaluation/ water use

R202902 68A BURIED ASPHALT MEMBRANE CANAL LININGS

Buried asphalt membrane linings provide low-cost seepage control on irrigation canal systems. A study was conducted on the aging characteristics of this lining. Of 112 field samples evaluated, over 80% demonstrated satisfactory membrane resistance to field aging, and should provide adequate seepage control for many years beyond the 14-year service age studied. A study is described on a method of reducing canal seepage by injecting an asphalt emulsion under the soil to form an impervious membrane. This application is intended for use in unlined canals with water delivery commitments that do not allow dewatering for conventional lining construction.

R202902 68A

Ellsperman, L M and Morrison, W R

ASPHALTIC MEMBRANES FOR WATER SEEPAGE CONTROL

Pap, Symp New Uses for Asphalts, Amer Chem Soc, Atlantic City, N J, Sept 1968. 43 p, 28 fig, 5 tab, 7 ref, append

Bureau of Reclamation, Denver, Colo

DESCRIPTORS--/ *lower cost canal linings/ *asphalt/ *bituminous materials/ weathering/ emulsions/ field tests/ materials testing/ membranes/ aging/ *buried membranes/ laboratory equipment/ impervious linings/ unlined canals/ *underwater construction/ injection/ *canal linings/ operation and maintenance/ *seepage/ *canal seepage
IDENTIFIERS--/ seepage control/ catalytically blown asphalt/ *underwater canal sealing/ cationic asphalt emulsions

R202877X68A ORTHOGONAL POLYNOMIALS FOR LEAST SQUARES

The technique normally used to obtain a functional relationship from
parameter measurements is a least squares regression analysis. If the
data are not linear, the least squares method becomes laborious because
of the required solution of simultaneous equations and the accumulation
of the sums of squares, cubes, and higher powers. A least squares re-
gression method based on orthogonal polynomials greatly reduces the
labor, especially for higher order polynomials. Orthogonal polynomials
are used as weighing factors in summations to yield regression con-
stants. They are not data dependent and need be computed only once for
use with many groups of data. This method does not require solution of
simultaneous equations, and the only sums required are those of weight-
data value products. In addition to ease of computation, benefits in-
clude a simple procedure for increasing the degree of the polynomial in
order to decrease fitting error, and a simple expression for the good-
ness of fit statistic. Tables are given to permit desk calculator de-
terminations of high degree fitting polynomials.

R202877X68A

Brockman, W E

LEAST SQUARES--AN EASY METHOD

University of Dayton, Ohio

DESCRIPTORS-- / *statistical analysis/ statistics/ *curve fitting/
experimental data/ calculations/ calibrations/ *mathematics/ curves/
mathematical analysis/ methodology/ instruction/ *correlation
techniques/ *nonlinear systems/ coefficients

IDENTIFIERS--/ *regression analysis/ *least squares method/ orthogonal
polynomials

R202885X68A DYNAMIC ANALYSIS BY MATRIX DECOMPOSITION

Matrix eigenvalue problems occur in many fields and constitute an impor-
tant class of problems in numerical analysis. A method is presented for
extracting eigenvalues and eigenvectors of a system, using a combination
of matrix iteration and matrix decomposition. Incorporation of the ma-
trix decomposition scheme with matrix iteration makes this method a
powerful tool for computer analysis of large systems. Shifting the
origin of eigenvalues can lead to convergence of eigenvalues and eigen-
vectors of the system in any desired region of interest. A new tech-
nique is presented for simultaneously extracting 2 or 3 close eigen-
values frequently occurring in the proximity of a new origin of eigen-
values to which the computations shifted. This method is satisfactory
for any valid structional stiffness matrix. In equations defining the
matrix iterative procedure, the matrix must be symmetrical. Results
have been compared to other standard techniques such as Jacobi and
Householder-QR Methods. In all cases, accuracy compared favorably
within the precision of the number of digits used in calculations.

R202885X68A

Rosen, Richard and Rubinstein, Moshe F

DYNAMIC ANALYSIS BY MATRIX DECOMPOSITION

University of California, Los Angeles
Mechanics Research Inc, El Segundo, Calif

DESCRIPTORS--/ dynamics/ *engineering mechanics/ matrix algebra/ symmetry/
*numerical method/ *mathematical analysis/ *structural analysis/
vibrations/ resonance/ stiffness

IDENTIFIERS-- / *matrix methods (structural)/ *eigenvalues/ iteration
method/ stiffness matrix/ dynamic stability/ dynamic response

R202876 68A AUTOMATIC RECORDING OF HYDROMETRIC DATA

The Devon River Authority has designed and constructed and is operating an automatic weather station, and a river water quality monitoring station. Sensors are included at the former for temperature, humidity, wind speed, solar radiation, and rainfall, and at the latter for temperature, dissolved oxygen, conductivity, pH, and suspended solids. Outputs from each sensor are fed into a Limpet Logger after suitable trimming to make them acceptable to the sensitivity range of the recording instrument. The Authority's experience with the Logger ranges from a prototype version with a single channel, modified to provide for a multichannel input, to the latest 10-channel version. Some problems encountered and success realized with the sensors are discussed. The Authority and Logger manufacturer, working as a joint venture, are developing prototype commercial package units. Magnetic tape records from the recorder can be translated into printout data or recorded on computer compatible tape.

DESCRIPTORS-- / *weather stations/ water quality/ *sensors/ *recording systems/ instrumentation/ wind (meteorology)/ solar radiation/ rain gages/ temperature/ humidity/ thermometers/ suspended solids/ pH/ measuring instruments/ dissolved oxygen/ radiation measurement/ automatic control/ *hydrometeorological station/ hydrology
IDENTIFIERS-- / foreign research/ Scotland

R202887X68A SPATIAL DISTRIBUTION OF STORM RAINFALL

A small experimental catchment basin in northern England was studied to investigate: (1) the network of nonrecording and recording rain gages required to give reliable qualitative impressions of spatial distribution of rainfall, and (2) the use of such a network to give improved estimates of average areal precipitation on the catchment by reinforcing the rainfall data from a few gages with prior knowledge of rainfall distribution. Spatial rainfall distribution was a function of the interplay between surface wind and topography. Variation in position of rain-shadow areas on the leeward side of hill barriers is governed by surface-wind direction. Areal extent and nature of rain-shadow areas are extremely variable and dependent on instability induced in the atmospheric boundary layer by the orographic barrier. This induced instability is a function of surface-wind speed. With access to rain gages and surface-wind information, a reasonable estimate can be made of average areal storm rainfall over the catchment basin.

DESCRIPTORS--/ *rainfall/ distribution/ forecasting/ *watersheds/ rain gages/ networks/ meteorology/ rainfall intensity/ recording systems/ topography/ wind (meteorology)/ telemetry systems/ *flood forecasting/ *storms/ hydrology/ *runoff forecasting

IDENTIFIERS-- / *spatial distribution/ catchments

R202865X68A POWER PLANNING FOR SOUTH CENTRAL BRAZIL

A survey of the hydroelectric power potential of South Central Brazil
is described. The survey was started Nov 1962, fieldwork completed
Dec 1966, and the final report issued Jan 1967. The hydraulic re-
sources survey consisting of 3 principal parts was: (1) to define the
hydroelectric potential of the major river basins in South Central
Brazil, to establish a preliminary classification of economic priority
of development, and to consider the possibilities of multipurpose de-
velopment for irrigation, navigation, flood control, and municipal water
supply; (2) to establish technical feasibility of some of the most
promising sites; and (3) to assist in a hydrometeorological survey, in-
cluding a comprehensive review of available data and establishment of a
basic network of hydrometric stations. Inventories of this survey con-
tain power potentials and cost data on 231 power and storage sites with
213,000-cu m storage capability and 32,500-mw power potential. Details
are given of power studies, available hydro resources, development of
a regional plan for ehv transmission, thermal power, comparative costs,
and program development.

R202865X68A

Cotrim, John R and Sexton, Jack K

THE POWER STUDY OF SOUTH CENTRAL BRAZIL

Montreal Engineering Co, Ltd, Canada; Central Eletrica de Furnas,
(Brazil)

DESCRIPTORS--/ planning/ *hydroelectric power/ project planning/ *river
basin development/ feasibility studies/ electric power costs/ electric
power demand/ multiple purpose projects/ multiple use/ water resources/
preliminary investigations/ storage/ municipal water/ foreign projects/
reconnaissance surveys
IDENTIFIERS--/ Brazil/ *hydroelectric power surveys/ economic growth/
site selection/ *hydroelectric resources

R202910 67A KINETICS OF METHANE FERMENTATION

Anaerobic waste treatment is a biological process employed in the sta-
bilization of municipal sewage sludges and organic industrial wastes.
A high degree of empiricism presently exists in the design and operation
of anaerobic treatment systems. To design such systems on a more ra-
tional and scientific basis, increased knowledge of process kinetics is
needed. This study evaluated the kinetics of the methane fermentation
step, the step generally considered to be the slowest or rate limiting
step in the process. Experimental results were evaluated in the context
of a widely used mathematical model of methane fermentation kinetics.
The results of this study provide a rational approach to the design and
operation of anaerobic digesters treating soluble wastes. Such an ap-
proach involves: (1) choosing a performance objective in the form of a
treatment efficiency or effluent quality; and (2) calculating the solids
retention time necessary to obtain this objective. Federal Water Pollu-
tion Control Administration Research Grant WP-00584, September 1963 to
February 1967. Has 94 references.

R202910 67A

Lawrence, Alonzo W and McCarty, Perry L

KINETICS OF METHANE FERMENTATION IN ANAEROBIC WASTE TREATMENT

Stanford University, Calif

DESCRIPTORS--/ kinetics/ bibliographies/ sanitary engineering/ sewage
treatment/ *sludge digestion/ *fermentation/ *anaerobic digestion/
mathematical models/ *methane/ *waste treatment/ *methane bacteria/
*anaerobic bacteria

IDENTIFIERS--/ *fatty acids

R202919 67A CHROMATIUM IN SEWAGE PONDS
An investigation was made of ecological factors influencing growth of
purple sulfur bacteria, particularly chromatium and thiopedia. By
utilizing radioactive sulfide indications were that sulfide uptake is
enzymatic in nature. Fructose, glucose, acetate, pyruvate, and
propionate were shown to be capable of supplying electrons for metabo-
lism of thiopedia. Fructose, glucose, acetate, pyruvate, lactate,
formate, and propionate can supply electrons for the metabolism of
chromatium. These organic compounds with the exception of pyruvate were
not capable of supplying carbon for synthesis of new cell material.
Thiopedia appears to be capable of utilizing substrates and producing
new cell material at slightly higher rates than chromatium. Both
organisms seem to exhibit a slight preference for thiosulfate over
acetate. Concentration of sodium thiosulfate above 500 ppm does not
appear to be a critical growth factor, but growth increases to a
maximum value at 6000 ppm of this compound for chromatium. Thiopedia
growth levels off at higher concentration. These concentrations are
extremely high compared to those present in most natural waste
effluents and may represent a limiting factor if other reduced sulfur
compounds are not present. Has 48 references.

R202919 67A

May, Donald S and Stahl, John B

THE ECOLOGY OF CHROMATIUM IN SEWAGE PONDS

Washington State University Bulletin 303, 1967. 73 p, 8 tab, 22 fig,
48 ref

Washington State University, Pullman

DESCRIPTORS-- / ecology/ sewage treatment/ cultures/ biochemical oxygen
demand/ *sewage bacteria/ *sulfur bacteria/ growth rates/ environmental
effects/ *sewage lagoons/ anaerobic digestion/ anaerobic bacteria/ odor/
photosynthetic bacteria

IDENTIFIERS--/ *chromatium/ *thiopedia

R202922 67A ANAEROBIC FILTER FOR WASTE TREATMENT
The anaerobic filter efficiently treats dilute soluble organic wastes at
loadings comparable to those applied to other biological treatment
processes. Nominal temperature operation is possible because a long
biological solids retention time can be maintained. Solids production
is exceptionally low so that the filter can be operated for long periods
of time without sludge wasting. The effluent from the anaerobic filter
is low in suspended solids and these settle readily. Sulfides result-
ing from sulfate reduction, and remaining biochemical oxygen demand in
the treated effluent can be effectively removed by aeration or other
suitable means. The low head loss through the filter indicates power
requirements for filter operation are almost nonexistant. In addition
the methane released from decomposition of the wastes represents a
useable power supply. The combined advantages of the anaerobic filter
suggest the possibility of a treatment plant with low maintenance
requirements, and one in which sludge handling and disposal problems
are minimized. This investigation was supported by Federal Water
Pollution Control Administration Research Grant WP-000584.

R202922 67A

Young, James C and McCarty, Perry L

THE ANAEROBIC FILTER FOR WASTE TREATMENT

Pap, Purdue Ind Waste Conf, Purdue Univ, West Lafayette, Ind, May 1967.
29 p, 7 fig, 3 tab, 9 ref, disc

Stanford University, Palo Alto, Calif

DESCRIPTORS-/ filters (fluid)/ filtration/ filter stones/ sanitary
engineering/ sewage treatment/ microorganisms/ *waste treatment/
treatment facilities/ filters/ trickling filters/ anaerobic conditions/
*anaerobic digestion/ anaerobic bacteria/ *organic wastes/ decomposing
organic matter/ biological treatment/ biodegradation
IDENTIFIERS--/ *anaerobic filters/ anaerobic processes

R202933 67A NITROGEN CYCLE IN FACULTATIVE PONDS
A laboratory model of a facultative waste stabilization pond was used
to investigate nitrification and denitrification of milk wastes as a
function of depth. The model was operated on a continuous flow basis
using dry milk product as feed. Organic and hydraulic loading were
kept constant. General pond characteristics were evaluated by measuring
dissolved oxygen, pH, oxidation reduction potential and temperature
profiles; chemical oxygen demand and different forms of nitrogen were
monitored at frequent intervals during the test period to determine
depth profiles of these parameters as well as COD removal efficiencies
and nitrogen transformations. A rapid removal of organics occurred in
or near the bottom sediment layer with a correspondingly high degree of
ammonification. Above the bottom layer the contents remained
essentially unchanged except for minor variations due to algal density
fluctuations. Detectable concentrations of nitrates were not found
during the test period, but a substantial amount of nitrogen was lost
from the liquid fraction. COD and nitrogen removals from the waste, as
measured by overflow, were 85 and 44%, respectively. Has 38 references.

R202933 67A

Aguirre, Jorge and Gloyna, E F

NITRIFICATION AND DENITRIFICATION IN A MODEL WASTE STABILIZATION POND

Center Res Water Resources Tech Rep EHE-05-6701, May 1967. 82 p,
22 fig, 5 tab, 38 ref, 2 append

University of Texas, Austin

DESCRIPTORS-- / waste disposal/ milk/ nitrogen/ sanitary engineering/
algae/ sewage treatment/ microorganisms/ bacteria/ *nitrification/
*oxidation lagoons/ model studies/ eutrophication/ waste treatment/
*sewage lagoons/ *denitrification/ nutrients/ bibliographies

IDENTIFIERS--/ *waste stabilization ponds/ sewage stabilization/ *milk
wastes

R202904 67A SWELLING BEHAVIOR OF COMPACTED CLAY SOILS
Basic concepts of soil chemistry, soil physics, and soil structure re-
lating to the expansive behavior of compacted clays are examined. A
model of the swell pressure mechanism is presented. Equations are
derived for the vertical and horizontal components of swell pressure in
compacted clay soils with flocculated and dispersed structures in terms
of average particle orientation and net interparticle swell pressure.
Theoretical values of swell pressure agree closely with experimental
values, and the concepts of soil structure offer a reasonable explana-
tion for swelling behavior of compacted clays. Thixotropic hardening
is one of the most important factors determining swelling behavior of
undisturbed and remolded clays. Results of the investigation were
related to fundamental aspects of clay colloid chemistry and soil
structure. Practical implications of the results are indicated, with
particular reference to fundamental physicochemical and engineering
properties of clay soils. A series of tests indicated that kaolinite
clays, unlike montmorillonite, do not exhibit thixotropic character-
istics. Has 20 references.

R202904 67A

Nalezny, Charles L and Li, Mo C

EFFECT OF SOIL STRUCTURE AND THIXOTROPIC HARDENING ON THE SWELLING
BEHAVIOR OF COMPACTED CLAY SOILS

Highway Res Rec, No 209, pp 1-22, 1967. 22 p, 22 fig, 20 ref, disc

Bell Telephone Laboratories, Murray Hill, N J; New York University,
New York

DESCRIPTORS--/ *soil structure/ *thixotropy/ *swelling/ *clays/ kaolin/
clay minerals/ *expansive clays/ soil chemistry/ soil physics/ *soil
physical properties/ soil chemical properties/ moisture content/ soil
compaction/ ion exchanges/ montmorillonites/ laboratory tests/ cohesive
soils/ soil mechanics/ bibliographies
IDENTIFIERS-- / *swelling pressures/ Van Der Walls Force/ compacted soils

R202882X68A AESTHETICS IN POWER TRANSMISSION
The Bureau of Reclamation's policy and criteria for improving the ap-
pearance of power transmission facilities are summarized. Environmental
planning in locating transmission lines, switchyards, and substations is
discussed. The concept and development of simplified low silhouette de-
signs for steel structures employing rigid-frame-type structures to
achieve optimum aesthetic effects within economic limits is presented.
Use of color and landscaping and ways to improve existing installations
are suggested. Photographs and drawings illustrating the criteria being
implemented to improve appearance of power transmission facilities are
included.

R202882X68A

Rose, Edwin and Covington, Dwight A

IMPROVED APPEARANCE OF POWER TRANSMISSION FACILITIES

Amer Soc Civil Engs Environ Eng Conf, Chattanooga, Tenn, May 13-17,
1968. 42 p, 20 fig

Bureau of Reclamation, Denver, Colorado

DESCRIPTORS-/ *aesthetics/ transmission lines/ transmission towers/
*substations (electrical)/ steel structures/ environment/ *transmission
(electrical)/ policy matters/ design criteria/ topography/ right-of-way/
herbicides/ clearing/ colors/ structural design/ switchyards
(electrical)
IDENTIFIERS--/ *beautification/ *landscaping/ land clearing

R202884X68A STOCHASTIC MODEL OF EARTHQUAKE MOTIONS
Eight strong-motion accelerograms, recorded on firm ground and at mod-
erate epicentral distances, are studied to develop a reasonable sto-
chastic representation of the time history of ground accelerations
during strong earthquakes. Results indicate that nonstationary random
processes are needed to describe the records over durations of interest
in structural response calculations. A nonstationary Gaussian filtered
shot-noise process was examined for this purpose. The member functions
of the mathematical model and their associated linear response spectra
were compared with corresponding information obtained from recorded
accelerograms. On this basis, a nonstationary Gaussian filtered shot-
noise process, with a second-order filter, was proposed for stochastic
simulation of strong-motion earthquakes. Has 23 references.

R202884X68A

Amin, Mohammad and Ang, Alfredo H S

NONSTATIONARY STOCHASTIC MODEL OF EARTHQUAKE MOTIONS

Proc Amer Soc Civil Eng, J Eng Mech Div, Vol 94, No EM2, pp 559-583,
Apr 1968. 21 fig, 3 tab, 23 ref, 2 append

University of Illinois, Urbana

DESCRIPTORS--/ *earthquakes/ seismic waves/ seismology/ accelerographs/
mathematical analysis/ noise/ probability/ vibrations/ models/ design
tools/ kinetics/ geophysics/ structural behavior/ *seismic design

IDENTIFIERS-- / mathematical models/ *stochastic models/ earthquake
engineering/ *random vibration theory/ seismic studies

R202905X68A   INFLUENCE SURFACES FOR CONTINUOUS PLATES

Influence surfaces are valuable aids for computating moments in plates
caused by concentrated loads. Influence surfaces presented were
drawn from influence coefficients computed by a numerical procedure
coded for a digital computer. Four moment locations were considered
in the interior panel of a continuous structure composed of 9 square
panels, arranged 3 by 3, and supported along the edges by rigid
columns. When supporting beams have zero flexural and torsional
stiffness, the 9-panel structure is representative of a plate sup-
ported by rigid columns at the corners of each panel. When beams are
considered to have stiffness, the structure analyzed is representa-
tive of a plate continuous on all 4 edges and supported on deflecting
beams and rigid columns at the corners. Accuracy of the computations
was checked by comparing computer results with those obtained by a
more exact method of solution. The comparison indicated that the
finite difference method rounds off discontinuities occurring in the
more exact solution; however, a comparison of values from the 2 meth-
ods at some distance from a discontinuity indicated no difference be-
tween them.

R202905X68A

Woodring, Richard E and Siess, Chester P

INFLUENCE SURFACES FOR CONTINUOUS PLATES

Proc Amer Soc Civil Eng, J Struct Div, Vol 94, No ST1, pp 211-226, Jan
1968. 16 p, 16 fig, 1 tab, 9 ref, append

University of Illinois, Urbana

DESCRIPTORS--/ *plates/ *structural engineering/ stiffness/ surfaces/
beams/ bending moments/ moment distribution/ finite differences/ *flat
plates/ computer programming/ loads/ *structural design/ *structural
analysis/ continuous structures/ discontinuities

IDENTIFIERS--/ *influence lines/ *influence surfaces/ finite difference
method

R202930 67A   TRANSPIRATION CONTROL BY STOMATA

Plant canopies are not passive evaporating surfaces. The regulation of
water loss from plants is an important function of leaf stomata, and
significant stomatal regulation occurs throughout the range of leaf-
pore diameters. Leaf pores do not interfere with one another to any
significant extent in the conductance of water vapor or other gases.
The diffusive conductance of small pores is more sensitive to diameter
changes at the larger apertures, thus permitting carbon dioxide exchange
for photosynthesis without dehydration of the leaf mesophyll. In still
air the external resistance over broad leaves limits control by stomata,
but light drafts usually minimize this effect in field situations.
Characteristic diffusion coefficients for leaf types, based on a careful
study of leaf microstructure, physiology, and seasonal variation, are a
rational basis for cover-type conversions or biochemical controls to
reduce water loss. Has 34 references.

R202930 67A

Lee, Richard

THE HYDROLOGIC IMPORTANCE OF TRANSPIRATION CONTROL BY STOMATA

Water Resources Res, Vol 3, No 3, pp 737-752, 3rd Quarter, 1967. 16 p,
8 fig, 9 tab, 34 ref

Pennsylvania State University, University Park

DESCRIPTORS--/ evaporation/ diffusion/ water yield/ bibliographies/ water
vapors/ consumptive use (water)/ biology/ absorption/ membranes/ pores/
*evapotranspiration/ *stomata/ *transpiration control/ microenvironment/
watershed management/ *transpiration/ leaves

IDENTIFIERS--/ multiperforate membranes/ *leaf resistance

WATER-PLANT-SOIL RELATIONS

R202932 67A MICROCLIMATIC MODIFICATION BY WATER SPRAY
An experiment to evaluate the effect of a curtain of water mist on
microclimate of crops and soil is discussed. The objectives of the
study are to measure the turbulent transport of momentum, heat, and
water vapor as influenced by an ultrafine water spray. The data to be
collected are expected to support theoretical equations describing this
phenomenon of outdoor air conditioning. The study also will evaluate
the use of mist spray to alleviate heat stress on crops, livestock, and
humans; to reduce wind erosion of soil; and to prevent frost damage.
Special instrumentation, developed for the study, is described and
includes the mist spraying apparatus, the meteorological sensors, and
an automated data acquisition system for collecting and transferring the
data to a high speed digital computer. Has 20 references.

R202932 67A

Harrington, James B, Jr

MICROCLIMATIC MODIFICATION BY WATER SPRAY

Department of Agr Eng, Michigan State Univ Termination Rep OWRR A-004-
MICH, Aug 1967. 16 p, 4 fig, 20 ref

Michigan State University, East Lansing

DESCRIPTORS--/ *microclimatology/ humidity/ erosion control/ spraying/
instrumentation/ bibliographies/ evaporation/ air temperature/ fungus/
climatology/ crops/ weather modification/ meteorological instruments/
micrometeorology/ advection/ water cooling/ *mist irrigation/ frost
prevention/ mist
IDENTIFIERS--/ microclimate modification

WATER POLLUTION

R202909 67A COST OF CLEAN WATER: MEAT PRODUCTS INDUSTRY
Industrial Waste Profile No 8 is concerned with meat products. This
study is part of the National Requirements and Cost Estimate Study re-
quired by the Federal Water Pollution Control Act as amended. The act
requires a comprehensive analysis of the requirements and costs of
treating municipal and industrial wastes and other effluents to attain
prescribed water quality standards. The Industrial Waste Profiles were
established to describe the source and quantity of pollutants produced
by each of the 10 industries studied. The profiles were designed to
provide industry and government with information on the costs and al-
ternatives involved in dealing effectively with the industrial water
pollution problem. They include descriptions of the costs and effec-
tiveness of alternative methods of reducing liquid wastes by changing
processing methods, by intensifying use of various treatment methods,
and by increasing utilization of wastes in byproducts or water reuse in
processing. They also describe past and projected changes in process-
ing and treatment methods. This profile on meat products is in 2 parts.
Part I deals with meatpacking and Part II with poultry processing. Has
71 references.

R202909 67A

Anon

COST OF CLEAN WATER, VOL III: INDUSTRIAL WASTE PROFILES, NO 8, MEAT
PRODUCTS

Federal Water Pollut Contr Admin Publication IWP-8, Sept 1967. 50 p,
50 tab, 7 fig, 71 ref

Wichita State University, Kansas

DESCRIPTORS-- / wastes/ water reuse/ waste disposal/ industrial plants/
economics/ costs/ industries/ bibliographies/ pollution abatement/ water
pollution/ *industrial wastes/ *treatment facilities/ *waste water
treatment/ waste water disposal/ byproducts/ *waste treatment/ *water
pollution sources/ pollutants
IDENTIFIERS--/ poultry/ *poultry processing industry/ *meat processing
industry

R202911 68A ACID MINE DRAINAGE STUDY

A small drift coal mine in Vinton County, Ohio, was characterized and instrumented to permit a detailed study of the influence of oxygen concentration, microbiological factors, and hydrologic features on rate of pyrite oxidation within the system. This experimental mine will be treated as a pilot-scale reactor to obtain information in a natural environment on the kinetics of the reaction responsible for acid mine drainage. Six observation wells were dug and core samples taken at selected points surrounding the mine to establish ground water table and the aquifer supplying the mine. Base rate data of acid runoff as a function of waterflow rate and water level in observation wells were collected. The mine was sealed and maintained under a slight positive pressure of nitrogen. Oxygen concentration dropped to less than 2% in 3 months. When "sealed" in a conventional manner, the atmosphere in the mine never dropped below 10% oxygen after being closed for several years. Acid runoff decreased approximately 50% after 6 months under nitrogen pressure. The response time of the mine to imposed changes and characterization of reaction sites, in terms of physical and chemical environment, as well as location, are now being studied.

R202911 68A

Smith, E E and Shumate, K S

DEVELOPMENT OF A NATURAL LABORATORY FOR THE STUDY OF ACID MINE DRAINAGE

Water Resources Center, Ohio State Univ, Feb 1968. 35 p, 15 fig, 4 tab, 4 ref

Ohio State University, Columbus

DESCRIPTORS--/ pilot plants/ mass transfer/ *acids/ *mines/ oxygen/ water pollution/ oxidation/ pyrites/ *mine drainage/ *acid mine water/ water pollution control/ acid bacteria/ chemical reactions/ microbiology/ *coal mine wastes/ coal mines/ observation wells/ drainage water

IDENTIFIERS--/ *pyrite oxidation

R202912 68A COST OF WASTE TREATMENT FACILITIES

This volume of the Cost of Clean Water reports contains a tabular breakdown of estimated construction costs of municipal treatment works and sanitary sewers, and the operation and maintenance costs of treatment works. The data are shown for each of the 50 States and District of Columbia and the Nation's major river basins as described by the Water Resources Council. The purpose of this volume is to make available for easy reference statistical data on construction requirements and costs by state and water resources regions. Breakdowns of the capital outlay components for upgrading of facilities, for construction of new facilities for untreated wastes, for increases in population and for depreciation replacement are also shown geographically for the 5-yr period, 1969-1973. The volume also gives similar geographical compilations of the operation and maintenance costs that would be associated with such a construction schedule. Finally, there is a summary of states and regions of the need for sanitary sewers with estimates of the requirements and costs of sewering presently unsewered urban populations and constructing sewers for increases in the urban population.

R202912 68A

Anon

COST OF CLEAN WATER, VOL IV: STATE AND MAJOR RIVER BASIN MUNICIPAL TABLES

Federal Water Pollut Contr Admin Rep, Jan 1968. 44 p, 2 fig, 38 tab, append

Federal Water Pollution Control Administration, Washington, D C

DESCRIPTORS--/ *costs/ economics/ *construction costs/ *sewage treatment/ *sewers/ operation and maintenance/ states (geographical)/ *sewage works/ municipal wastes/ water quality control/ waste water disposal/ *treatment facilities/ *waste treatment/ cost analysis/ cost trends/ *maintenance costs/ *operating costs

IDENTIFIERS--

R202913 67A HOUSEBOAT WASTES, COLLECTION & TREATMENT
Methods of collection and treatment for houseboat and moorage waste-
waters are reviewed. Several methods using alternative materials are
considered and approximate installed costs are given. Emphasis is on
solution of the problem in the State of Oregon but information devel-
oped is applicable in adjacent states and elsewhere with appropriate
adjustments.

R202913 67A

Clark, B D

HOUSEBOAT WASTES METHODS FOR COLLECTION AND TREATMENT

Federal Water Pollut Contr Admin Rep, Pacific NW Water Lab, June 1967.
83 p, 15 fig, 7 tab, 10 ref, append

Federal Water Pollution Control Administration, Corvallis, Oreg

DESCRIPTORS--/ *boats/ *wastes/ costs/ *waste disposal/ water pollution/
pollution abatement/ sewage/ sewage disposal/ sewage treatment/ Oregon/
domestic wastes/ *waste treatment

IDENTIFIERS-- / *houseboats/ *moorages/ floating structures

R202914 67A PHOTOSYNTHETIC REOXYGENATION
This dissertation describes the potential reduction of dissolved oxygen
in ponds and streams due to chlorophyll inhibition resulting from
certain industrial wastes. Emphasis is placed on the laboratory
techniques developed for this study and the changes that should be
incorporated in waste stabilization pond designs. Has 78 references.

R202914 67A

Huang, Ju-Chang and Gloyna, Earnest F

EFFECTS OF TOXIC ORGANICS ON PHOTOSYNTHETIC REOXYGENATION

Center Res Water Resources Tech Rep, August 1967. 163 p, 64 fig, 24
tab, 78 ref, 3 append

University of Texas, Austin

DESCRIPTORS-- / *dissolved oxygen/ bibliographies/ organic compounds/
oxidation/ *photosynthesis/ algae/ laboratory tests/ reviews/ *toxicity/
industrial waste treatment/ *chlorophyll/ *industrial wastes/ waste
treatment/ oxidation lagoons/ photosynthetic oxygen/ oxygenation

IDENTIFIERS--/ *chlorophyll inhibition/ *waste stabilization ponds

R202915 66A GUIDE TO COMMON DIATOMS
Descriptions of the diatom species which are most frequently encountered
at Water Pollution Surveillance System Stations have been assembled in
this illustrated guide prepared to serve as a bench reference for
laboratory biologists being trained in diatom identification. The guide
also contains a glossary and generic key. The key was constructed with
the beginner in mind, and is based entirely on the shape and markings
of the diatom cell wall as observed in material mounted in hyrax. No
attempt was made to place the taxa in their proper phylogenetic order.

R202915 66A

Anon

GUIDE TO THE COMMON DIATOMS AT WATER POLLUTION SURVEILLANCE SYSTEM
STATIONS

Federal Water Pollut Contr Admin Rep, Washington, DC, June 1966. 98 p,
164 fig, 2 chart

Federal Water Pollution Control Administration, Cincinnati, Ohio

DESCRIPTORS--/ plankton/ algae/ classifications/ aquatic life/ *diatoms/
microscopy/ microorganisms/ dictionaries/ *systematics/ phytoplankton/
aquatic plants/ *aquatic algae/ pollutant identification/ water
pollution control

IDENTIFIERS--

R202916 67A EFFECTS OF WATERSHED PRACTICES ON STREAMS
This work supported by the Federal Water Pollution Control Administra-
tion's Research Grant WP423 has had the following objectives: (1) to
determine the significance of stream temperature changes associated with
logging, (2) to predict stream temperature in small mountain streams,
(3) to determine the changes in suspended sediment loads prior to and
after logging, (4) to determine the·factors controlling algal produc-
tivity in small streams and the effects of logging on this basic source
of food energy for fish populations, and (5) to determine the effects
of logging on the stream as a habitat for populations of anadromous and
resident fish. The work reported was undertaken primarily in experi-
mental watersheds established in the Alsea basin of the Oregon Coast
Range about 12 mi south of Toledo, Oregon, and approximately 10 mi from
the Pacific Ocean. The watersheds were selected for the predominance of
commercial forest cover and their significance as spawning streams for
coho salmon. One watershed was partially logged with 3 small clearcuts,
another was completely clearcut, and the third remained uncut as a con-
trol. The effects of the logging operation are still being evaluated
and this progress report is preliminary.· Has 20 references.

R202916 67A

Hall, James D and Krygier, James T

STUDIES ON EFFECTS OF WATERSHED PRACTICES ON STREAMS: PROGRESS REPORT

Progr Rep, Agr Exp Sta, Forest Res Lab, Oregon State Univ, May 1967.
95 p, 23 fig, 23 tab, 20 ref, append

Oregon State University, Corvallis

DESCRIPTORS--/ *lumbering/ algae/ water quality/ bibliographies/ fish/
*logging/ watersheds/ *streams/ soil erosion/ suspended sediments/ road
construction/ *water temperature/ *clear-cutting/ suspended load/ water
quality control/ watershed management/ *forest management/ *sediment
yield/ *demonstration watersheds
IDENTIFIERS--/ *stream temperature

R202918 67A   SELECTED FWPCA PUBLICATIONS
The leaflets and publications listed have been selected to increase the
average reader's knowledge of an environmental problem which is assum-
ing greater importance each year.   The Federal Water Pollution Control
Administration's publications are listed under the following headings:
(1) Publications for the General Reader; (2) Pubications Transferred to
Federal Water Pollution Control Administration from Public Health Ser-
vice; (3) Advanced Waste Treatment Research Publications and Environ-
mental Health Series Reports; (4) Publications for Readers with Special
Interests, and (5) Miscellaneous Non-numbered Publications.

R202918 67A

Anon

WATER AND WATER POLLUTION CONTROL: A SELECTED LIST OF PUBLICATIONS

Federal Water Pollut Contr Admin Rep, Oct 1967. 16 p

Federal Water Pollution Control Administration, Washington, D C

DESCRIPTORS--/ *bibliographies/ *water pollution/ pollution abatement/
water quality/ documentation/ *water pollution control/ water quality
control/ *publications/ waste treatment

IDENTIFIERS--

R202920 67A   POLLUTION CONTROL COST SHARING WITH INDUSTRY
This report summarizes an evaluation of the advisability of further
assistance for industry and possible alternative approaches for such
assistance. The report is part of a larger effort to look at the
economic impact of pollution abatement as directed by the President.
The report is divided into 6 parts: (1) Summary; (2) Recommendations;
(3) Magnitude and nature of present Federal assistance to industry;
(4) Summary of the expenditures currently made by industry; (5) Esti-
mates of costs of air and water abatements; and (6) Analysis of several
proposed Federal subsidies. The average additional annual costs caused
by higher levels of pollution abatement are estimated to be significant
but relatively small for all manufacturing firms. Moreover, Federal
assistance to industry is already sizeable and is growing especially in
the area of R&D intended to lower abatement costs. Therefore the need
and desirability of additional assistance for industry should be judged
on the basis of hardship or burden on particular industries, firms or
plants (or hardship on particular communities) caused by abatement
actions rather than on the burden to industry as a whole.

R202920 67A

Anon

COST SHARING WITH INDUSTRY: SUMMARY REPORT OF THE WORKING COMMITTEE ON
ECONOMIC INCENTIVES (REVISED)

Federal Coordinating Comm on Econ Impact Pollut Abatement, Washington,
DC, Nov 1967. 37 p, 11 tab

DESCRIPTORS--/ economics/ *costs/ *pollution abatement/ water quality/
industrial plants/ *industries/ electric powerplants/ water pollution/
*water pollution control/ *financing/ treatment facilities/ grants/
*industrial wastes/ water quality control/ waste water disposal/ air
pollution
IDENTIFIERS-- / *Federal assistance/ air pollution control/ incentives

R202921 68A ANALYSIS OF WATER POLLUTION CONTROL COSTS
This is a detailed analysis of the national requirements and costs of
water pollution control. The report is in 3 parts: Part I, Municipal
Requirements and Cost Estimates; Part II, Industrial Requirements and
Cost Estimates; Part III, Other Effluent Requirements and Cost Esti-
mates. This report comprises Volume II of a 4 volume series on the
cost of water pollution control. Has 255 references.

R202921 68A

Anon

COST OF CLEAN WATER, VOL II: DETAILED ANALYSES

Federal Water Pollut Contr Admin Rep, Jan 1968. 244 p, 11 fig, 69 tab,
255 ref, 5 append

Federal Water Pollution Control Administration, Washington, D C

DESCRIPTORS--/ *costs/ waste disposal/ *pollution abatement/ sewage
treatment/ construction costs/ capital costs/ financing/ water quality
control/ waste water disposal/ *treatment facilities/ municipal wastes/
industrial wastes/ operating costs/ maintenance costs/ *water pollution
control/ bibliographies
IDENTIFIERS--

R202923 66A SANITARY SIGNIFICANCE OF FECAL COLIFORMS
This compilation of previously published research papers by personnel
of the Microbiological Activities, Basic and Applied Sciences Program,
Cincinnati Water Research Laboratory, (Robert A Taft Sanitary Engineer-
ing Center), brings together in one volume much of the information
concerning fecal-coliform bacteria that has appeared in various scien-
tific journals. The material is organized into 7 chapters that include
background, methodology, and occurrences in warmblooded animals in-
cluding man, fresh water fish, vegetation, insects, and soil. The
final section covers the interpretation and significance of fecal-
coliform bacteria in water pollution studies. Has 153 references.

R202923 66A

Geldreich, E E

SANITARY SIGNIFICANCE OF FECAL COLIFORMS IN THE ENVIRONMENT

Federal Water Pollut Contr Admin Publication WP-20-3, Washington, DC,
1966. 122 p, 4 fig, 35 tab, 153 ref

Robert A Taft Sanitary Engineering Center, Cincinatti Water Research
Laboratory, Ohio
DESCRIPTORS--/ fish/ insects/ soils/ vegetation/ *water pollution/
sanitation/ *bacteria/ stream pollution/ chemical analysis/ sewage/
microorganisms/ animals/ *coliforms/ fresh water fish/ oxidation
lagoons/ sewage lagoons/ bibliographies

IDENTIFIERS--/ *fecal coliforms

R202927 68A ECONOMIC IMPACT OF WATER QUALITY STANDARDS
This study presents and evaluates the available data dealing with the
requirements of state and local governments to achieve the standards of
the Federal Water Pollution Control Administration program; it places
the program in its perspective relative to other, competing issues con-
fronting the affected units of government; and it appraises the major
financial and legal problems which will be encountered in implementing
the attendant standards. The study was prepared pursuant to Federal
Water Pollution Control Administration Contract 14-12-142.

R202927 68A

Anon

THE ECONOMIC IMPACT OF THE CAPITAL OUTLAYS REQUIRED TO ATTAIN THE
WATER QUALITY STANDARDS OF THE FEDERAL WATER POLLUTION CONTROL ACT

Eastman Dillon, Union Secur & Co Study, New York, N Y, Jan 1968. 227
p, 29 tab, 1 fig, 3 append

Federal Water Pollution Control Administration, Washington, D C

DESCRIPTORS--/ economics/ costs/ pollution abatement/ *water quality/
*capital costs/ standards/ construction costs/ water pollution/ grants/
water pollution control/ financing/ *water quality control/ treatment
facilities/ cost analysis/ cost trends/ *water quality act/ federal
jurisdiction/ state jurisdiction/ *legal aspects
IDENTIFIERS-- / *water quality standards

R202931 67A WATER POLLUTION FROM BEET SUGAR INDUSTRY
Primary attention is focused upon the beet sugar industry in the South
Platte River Basin. Beet sugar wastes are the largest source of pollu-
tion within the area. Ten sugar factories are dispersed throughout the
region and affect water quality over 300 mi of basin streams. This re-
port comprises 5 major parts. Section 1 consists of introduction and
background to the problem, and description of process operations. Sec-
tion 2 gives the results of industrial surveys and status evaluation of
each of the 10 factories in the basin. Section 3 discusses total fac-
tory waste loads before and after treatment. Section 4 describes the
bacteriological aspects of sugar beet waste pollution across the coun-
try. Section 5 offers a comprehensive review and evaluation of waste
abatement and treatment throughout the industry, both in the U S and
abroad. Has 69 references.

R202931 67A

Anon

THE BEET SUGAR INDUSTRY--THE WATER POLLUTION PROBLEM AND STATUS OF
WASTE ABATEMENT AND TREATMENT

Federal Water Pollut Contr Admin Rep, June 1967. 173 p, 50 fig, 16
tab, 69 ref

Federal Water Pollution Control Administration, Denver, Colo

DESCRIPTORS--/ *waste disposal/ *water pollution/ *pollution abatement/
*wastes/ water quality/ *industrial waste treatment/ industrial plants/
*sugar beets/ waste treatment/ treatment facilities/ waste water
treatment/ industrial wastes/ bibliographies

IDENTIFIERS-- / *South Platte Riv Basin Colo/ *sugar beet industry/ South
Platte River

R202862X68A COMPREHENSIVE RIVER BASIN PLANNING
The National Water Resources Council established by the Water Resources
Planning Act of 1965 is directing comprehensive investigations of water
and related land resources. These investigations will eventually in-
clude the entire United States. These studies are at reconnaissance
level of detail for the purpose of developing framework plans. The in-
vestigations, conducted by Federal-State groups, will provide for: (1)
economic analysis and projections; (2) translation of economic projec-
tions into demands for water and related land; (3) assessment of avail-
able water for quality and quantity; (4) assessment of available land
resources; (5) identification of current and projected water and related
land resource problems; (6) development of alternative plans for solu-
tion of problems; and (7) identification of critical water problems
calling for prompt action. Parameters to be considered in the framework
planning are national income, regional development, and quality of envi-
ronment. Definitions are given and applications are discussed.

R202862X68A

Christensen, Wallace R

COMPREHENSIVE RIVER BASIN PLANNING

Amer Soc Civil Engs Preprint 625, Nat Meeting Transp Eng, San Diego,
Calif, Feb 1968. 16 p

Pacific Southwest Region Planning Office, San Bernardino, Calif

DESCRIPTORS../ *river basin development/ project planning/ feasibility
studies/ water resources/ states (geographical)/ economics/ planning/
social values/ environment/ optimum development plans/ water development

IDENTIFIERS./ Federal agencies/ River Basin Commissions/ National Water
Resrcs Coun/ Federal-State cooperation

R202863X68A TRANSPORTATION OF DISTILLED SEA WATER
Distilled water is now generally recognized to be highly corrosive and a
difficult material to transport through ordinary water works systems.
Experiences at the San Diego and Freeport demonstration sea water dis-
tillation plants indicate the addition of polyphosphates and silicates
help to protect metals, but alkaline chemicals are needed to protect ce-
ment products. Studies are being made at the San Diego Water Test Fa-
cility to evaluate various methods for distilled water treatment, prob-
able efficacy under local conditions, and their relative cost and opera-
tional complexity. Temperature effects and cooling of distilled water
are also discussed. Two product water test programs have been planned
for the test facility. One will test various 16-in. dia pipe sec-
tions with buffered and unbuffered distilled water. The other will in-
clude coupons and small pipe segments using 4 different waters and dif-
ferent velocities.

R202863X68A

Dodson, Roy E

TRANSPORTATION OF DISTILLED SEA WATER

Amer Soc Civil Engs Nat Meeting Transp Eng, San Diego, Calif,
Preprint 601, Feb 1968. 19 p, 1 tab, 9 ref

City Department of Utilities, San Diego, Calif

DESCRIPTORS../ *water transportation/ water delivery/ water treatment/
*water pipes/ distillation/ *demineralization/ *corrosion/ water supply
systems/ *corrosion control/ concrete/ buffers (chemistry)/ asbestos
cement/ water quality/ cooling/ temperature/ concrete pipes/ pipes/ cast
iron
IDENTIFIERS./ San Diego, Calif/ *distilled water/ desalination plants/
Point Loma Plant, Calif/ water distribution

R202895 68A OPTIMIZING WATER CONVEYANCE SYSTEMS
Widespread plans for regional water supply systems involve transmission
of large quantities of water over great distances. For such plans to be
feasible, conveyance systems must be optimized and new concepts of oper-
ation adopted. Lifts previously considered impossible will be necessary
and will require maximum efficiency and reliability of pumping systems.
Potential size and distance of projected transmission aqueduct systems
are reviewed and possible requirements translated into design goals and
objectives for conveyance system optimization. Types of conveyance sys-
tems are examined regarding these goals and operational requirements.
The controlled-volume concept is reviewed and the need for controls and
instrumentation systems established. Current pipeline design practices
are analyzed for possible adaptation of other industry standards to wa-
ter programs. Potential pumping lifts are projected and the present
state of the art of hydraulic machinery summarized. Procedures for
development of optimum pump systems are given with examples of current
applications. Dependent upon cost of purchased power, the present value
of 1% efficiency for major water supply programs could exceed $10
million. Gives 19 references.

R202895 68A

Miller, David R and Miller, James P

OPTIMIZING CONVEYANCE SYSTEMS FOR WATER TRANSMISSION

Daniel, Mann, Johnson, and Mendenhall, Los Angeles, Calif

DESCRIPTORS--/ *optimum development plans/ water costs/ water delivery/
*water transportation/ *conveyances/ water resources/ planning/ canals/
pipelines/ tunnels/ automatic control/ pumping plants/ pumps/ project
planning/ efficiencies/ bibliographies/ pumped storage/ *water supply
systems/
IDENTIFIERS-/ *optimization/ water plans/ *water transfer/ Tehachapi Mts,
Calif/ water shortages/ NAWAPA/ pumping

R202900 68A ECONOMIC USE OF WATER
The origin, scope, use, and cost of USSR water resources are discussed.
The USSR has the largest resources of fresh water in the world with sur-
face runoff amounting to 4,380 billion cu m annually and operating re-
serves of groundwater averaging 210 billion cu m annually. However,
territorial distribution is unequal with regions of greatest population
and industry having less than 20% of the surface runoff. By 1985, capi-
tal investments of the country's water resources will amount to 169.4
billion rubles. Agriculture is the heaviest user, consuming 125 billion
cu m of water; cities and workers' settlements use 8.4 billion cu m.
Approximately 720-750 billion cu m of water pass through hydroturbines
yearly. Waste and inefficient use of water are widespread among all
users and to encourage greater thrift and economy, a charge is proposed.
Tables show water consumption and scheduled water use charges for vari-
ous agricultural and industrial users.

R202900 68A

Loyter, M

ECONOMIC MEASURES FOR EFFICIENT USE OF WATER RESOURCES

DESCRIPTORS--/ water supplies/ *water utilization/ water costs/ industrial
water/ water resources/ agriculture/ hydroelectric power/ efficiencies/
economics/ foreign countries/ water conservation

IDENTIFIERS-- / fees/ USSR/ *water use

R202925 67A ECONOMIC ANALYSIS OF PUBLIC WATER SUPPLY
Economics of public water supply for 10 firms in the Piscataqua River
Watershed were analyzed in terms of the cost of production and distribu-
tion, plant size adjustments of waterworks systems, and variation in
use. The analysis revealed that management of these firms was usually
charging a price for water use based on average cost, computed on the
basis of past or historical investment. Such a pricing policy does not
provide for the replacement of wornout plant facilities. To provide for
replacement costs, and direct the responsibility of cost payment to the
actual users of the plant facilities, management was advised to charge
a higher average price. Methods chosen to increase a waterworks system
capacity determined the direction of average cost. Cost economies were
indicated when waterworks expanded capacity by (1) adding wells, (2)
adding or replacing pumps and auxiliary equipment, and (3) adding trans-
mission mains. Cost diseconomies were indicated as the result of ex-
panded plant capacity by (1) adding a surface supply, and (2) adding ex-
tensive treatment facilities. Cost-trend type of analysis used in this
study is useful to management in determining methods of expanding exist-
ing waterworks systems and in determining the geographic location of
prospective waterworks systems. Has 16 references.

R202925 67A

Forste, Robert H and Bourcier, Donald V

ECONOMIC ANALYSIS OF PUBLIC WATER SUPPLY IN THE PISCATAQUA RIVER
WATERSHED--I: AN AVERAGE COST APPROACH

Water Resources Res Center Bulletin 1, Univ New Hampshire, Mar 1967.
54 p, 25 fig, 7 illus, 7 tab, 16 ref, append

University of New Hampshire, Durham

DESCRIPTORS--/ costs/ water requirements/ economics/ *water costs/ *water
supply systems/ water treatment/ water utilization/ replacement costs/
bibliographies/ investment/ cost analysis/ diseconomies of scale/ water
distribution (applied)/ economies of scale/ water management (applied)/
watershed management/ prices/ *water rates
IDENTIFIERS--/ Piscataqua River Watershed

R202926 67A WATER QUALITY IN UPPER KLAMATH LAKE
This report defines the water quality in Upper Klamath Lake watershed
during the period March 1965 to April 1966. It identifies the sources
of algal nutrients and other constituents in water flowing into and out
of Upper Klamath Lake and compares the quantity of these constituents
in pristine streams, canals, rivers, agricultural drainage, and springs.
Chemical analyses were made of algae, lake sediment, and bottom fauna
samples. Algal species were identified and measured; during the period
of the study Aphanizomenon flos-aquae represented about 90-99% of the
total algal crop during the summer. Limiting nutrient studies using
the isotope Carbon-14 to measure variations in primary productivity
were conducted in situ and in the laboratory; data from these studies
were difficult to interpret. Has 30 references.

R202926 67A

Miller, William E and Tash, Jerry C

INTERIM REPORT, UPPER KLAMATH LAKE STUDIES, OREGON

Federal Water Pollut Contr Admin Publication WP-20-8, Sept 1967. 37 p,
1 fig, 14 tab, 30 ref

Eutrophication Research Branch, Pacific Northwest Water Laboratory,
Corvallis, Oreg
DESCRIPTORS--/ water quality/ water analysis/ impurities/ algae/ lakes/
sediments/ sampling/ aquatic life/ bibliographies/ phytoplankton/
*eutrophication/ *cyanophyta/ *aquatic algae/ Oregon/ benthic fauna/
bottom sediments

IDENTIFIERS--/ *algal nutrients/ Klamath Lake/ Upper Klamath Lake, Oreg/
water budget

R202929 67A OPTIMIZATION OF A WATER RESOURCES SYSTEM

For a deterministic hydrology, a model and optimization program are formulated to determine the monthly releases of water from a network of dams, rivers, and aqueducts which maximizes the joint output of the system from water and energy. The system model is nonlinear for the energy output from reservoir releases and the algorithm for optimization is a decomposition mathematical program, linear in the system constraints with dynamic programming used for the reservoir components where optimization is made over convex sets. The demand structures for firm water and energy permit secular changes with fixed monthly distribution of annual demand. A programming code is being tested which permits handling of 5 reservoirs for a 10-yr period.

R202929 67A

Parikh, Shailendra C, and Shephard, Ronald W

LINEAR DYNAMIC DECOMPOSITION PROGRAMMING APPROACH TO LONG-RANGE OPTIMIZATION OF NORTHERN CALIFORNIA WATER RESOURCES SYSTEM, PART I: DETERMINISTIC HYDROLOGY
Oper Res Center, Coll Eng, Univ California, Aug 1967. 65 p, 17 fig, 6 tab, 5 ref

University of California, Berkeley

DESCRIPTORS--/ *operations research/ optimum development plans/ water resources/ mathematical analysis/ hydrology/ reservoirs/ *mathematical models/ nonlinear systems/ *reservoir operation/ computer models/ linear programming/ computer programs/ dynamic programming/ *optimization

IDENTIFIERS--/ Central Valley, Calif/ deterministic model/ firm energy

NUMERICAL INDEX
Volume 1, Number 7